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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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A New Turret Head Lathe.

We give on this and succeeding pages illustrations of a turret head machine which embodies several radical departures from the regular practice in such machinery, enabling certain classes of work to be done on it that have not heretofore been attempted on turret head machines.

On this page a front and rear views of the machine are given, which show that the usual form of turret and mounting for the same has been entirely abandoned, and what may be termed a turntable is mounted upon what resembles the ordinary lathe carriage. This carriage is fed by rack and pinion with pilot wheel in the ordinary manner, or automatically as may be desired, and the turret revolves automatically. The carriage slides on large 90° Vs, and is gibbed to the bed outside front and back.

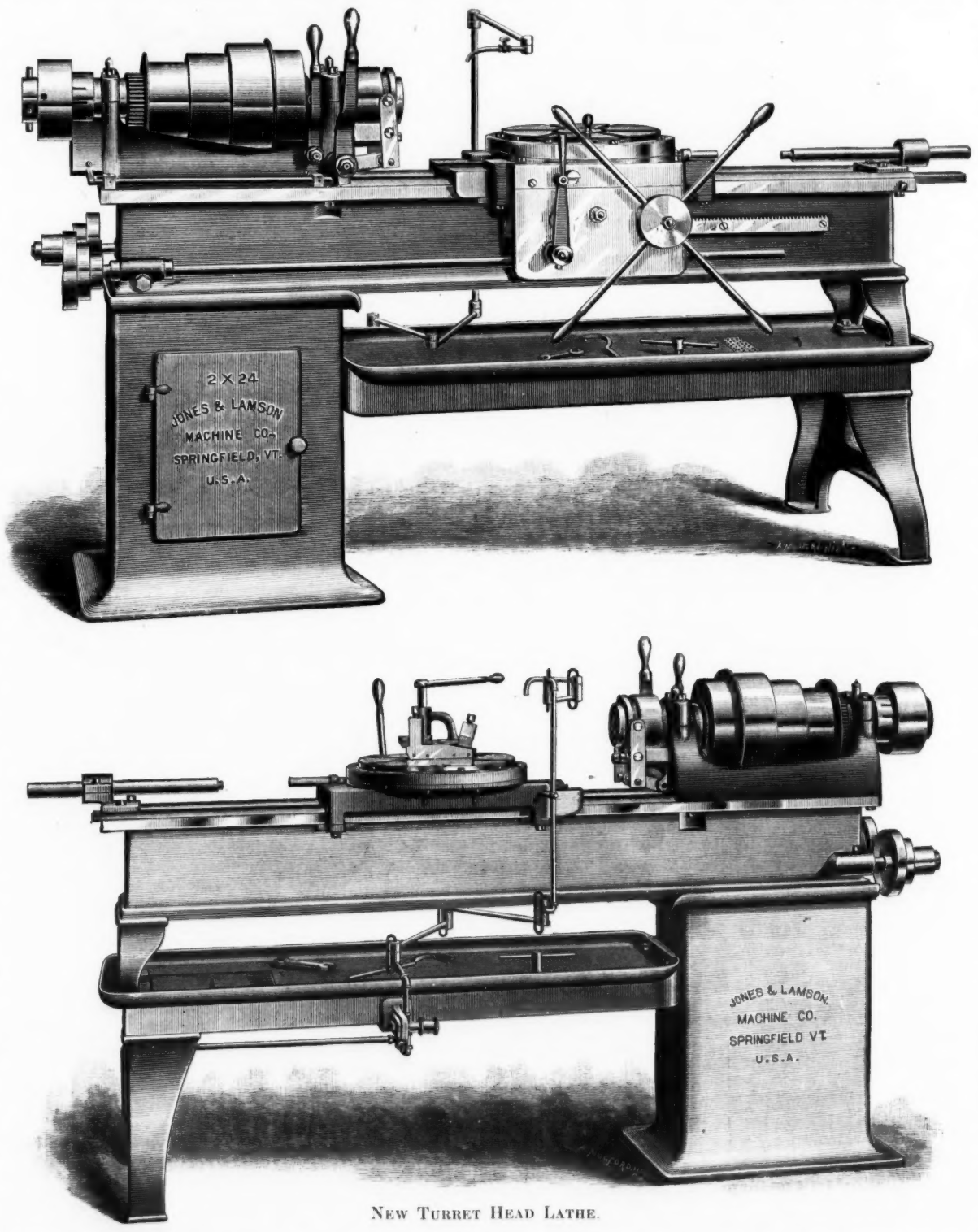
The various tool holders, turning devices, cut-off slides, etc., by which the work is done are simply attached to the top or upper surface of the turret by square tongues and grooves with bolts.

The turret, which is proportionately very much larger in diameter than usual, is gibbed all around its outer circumference, and the locking pin engages there. The cutting tools do not extend out over the turret, but are usually about vertically over the point of engagement of the locking pin, a fact which, as will be seen, practically relieves the central bearing of the turret of all stress during the cut, and enables the tool to be held much more steadily, other conditions being the same.

There are six slots for as many tool holders, and there is a separate stop for each one, which is adjustable independently of all the others, so that the point at which the feed will be automatically released, and the motion of the slide positively arrested, may be independently fixed for each tool and operation, instead of its being necessary to set all the tools but one to suit the point of feed release. The revolving mechanism is also arranged so that it can be made to act at the moment any tool clears the work, so that no loss of time results from running back further than is necessary for any given tool. Where less than the full number of tools are used, the revolving mechanism can be made to skip one or more places, so as to bring the next tool into position, wherever it may be.

It is well understood by mechanics that, while the turret head lathe or screw machine will distance the lathe for work to which it is adapted, it has its limitations, one of these being that there must be a comparatively large number of pieces to make that are just alike, otherwise it will not pay to set the various tools and arrange the machine for doing the work; the number of pieces needed to make it pay to do this depending, mainly, upon their character. This difficulty the builders of this machine have attempted to overcome by arranging the tools so that they can be set with a facility approaching that of lathe tools, and it is claimed by them that if there is but one piece to do, it will usually pay to do it on this machine, and that it is, therefore, well adapted to general machine shop work within its range of capacity, which is for work up to 2″ diameter and 24″ long.

Turret head machines have not heretofore been constructed for work of this length, nor for doing work so long in proportion to its diameter as can be done by this machine. Long work of small diameter is finished by means of the tool shown by Figs. 2 and 3 (page 2), the former being a front view, and the latter a rear view of the tool, which, by the makers, is called the "turner." It has the usual back rest to support the work, but this is so arranged as to be readily adjustable, and can be changed so that it either precedes or follows the tool. The tool is adjustable by screws, and can be moved to or from the work by a cam, which is moved by a small lever so that the tool may be run into the work for necking, or in the case of long and slender work the tool is opened, run up close to the chuck where the work is held securely, and the tool run in to the required depth. It is then fed backwards toward the end of the work, the rest following behind the tool, and bearing on that portion of the work that has been trued. In this way much of such work is finished at a single cut from the rough, though where it is necessary another cut can be run over it in the other direction, the rest in this case, as in the other, following the tool.



NEW TURRET HEAD LATHE.

The cut-off slide, a separate view of which is shown at Fig. 4, is bolted to the top of the turret, as shown by the rear view of the machine, and is so arranged that the turret can be run up under the chuck, and the cut-off used without interfering with any of the other tools. Provision is made for using three tools in the slide, and as they have the longitudinal motion due to the movement of the turret, and can be fed into the work by a lever and small pinion, the three tools can be used for different purposes, such as necking in, cutting off, or turning if desired.

The tool holder for hollow mills, taps, dies, reamers, drills, etc., is shown by Fig. 5. It is attached to the turret in the same way as the other tools, and performs its functions in the same way as the ordinary hole in the ordinary turret, except that the clamping screw is at the side next the operator, instead of being on top as usual. It is regularly made with a $3\frac{7}{16}$″ hole, but can be made any desired size so that tools of any other machine can be used.

The chuck used on the spindle is shown by the group of cuts, Fig. 6, which show it in various positions and in detail, making explanation unnecessary. One of the prime objects in its design has been to so arrange that the stock is held as close to the end of the spindle as possible, and it will be noted that the gripping jaws are as close to the end of the spindle as they can be placed. The chuck is automatic in the sense that it can be opened and closed without stopping the machine by the movement of the lever designated "roller feed and chuck lever" in the outline view, Fig. 7, this lever, by suitable connections, being made to slide the collar on the outside of the chuck which opens and closes the collet in the manner indicated in Fig. 6.

The same lever is connected to the automatic feeding device, Fig. 8. This is similar to the feed illustrated by us in our issue of July 24, 1890, and works in the same manner, the details of construction only being changed somewhat. There are two rollers that bear on the stock, one at each side. These, while a cut is being taken, serve to steady the work and hold it central in the spindle. When the lever already referred to is moved to open the chuck, and its motion is then continued in the same direction, it moves a plunger which engages with one of the V-grooves on the spiral ring gear, Fig. 8, preventing it from turning. The spindle of the machine, continuing to turn, carries the spiral pinion with the two worms, worm wheels and feed rolls with it, and by this motion about the spiral ring gear they are made to rotate on their own axes, and the stock is thus fed forward through the chuck to the stop, and held there until the chuck is again closed. The hole through the spindle is large enough to take in 2″ stock easily, and when very small stock is used there is a bushing sleeve that goes in, and keeps the stock near enough to the center so that the entering end of a new bar will push the preceding one through as it is advanced by the feed rolls.

The back gears are beneath the spindle, and there is a clutch by which the spindle is driven direct or by back gears without stopping the machine to make the change, the clutch connecting to the cone pulley by friction, and to the main gear on the spindle by a positive lock.

Prof. Sweet's idea is carried out with regard to supporting the machine, it resting on three bearings, two of which are on top of the cabinet column, and the other at the top of the short legs. The column being flexibly connected to the bed, no variation in deflection can occur from change in the floor or foundation.

With tools which can be furnished by the builders of the machine, taper work or work of irregular outline, such as handles for machine tools, can be produced on the machine in sizes ranging up to its full capacity for diameter and length, and it has been found to be an efficient machine for such work.

A rotary pump supplies abundant oil or other lubricant, and the delivery pipe is arranged to follow the tool that may be cutting, and deliver the oil where it is needed, without attention.

Principal dimensions of the machine are: Working length, 24″; hole through spindle, 2⅛″; diameter of turret, 16″; swing over bed, 16″; width of belt used, 3½″; length of bed, 6 feet 8 inches; weight, 2,600 pounds. Builders are the Jones & Lamson Machine Co., Springfield, Vt.

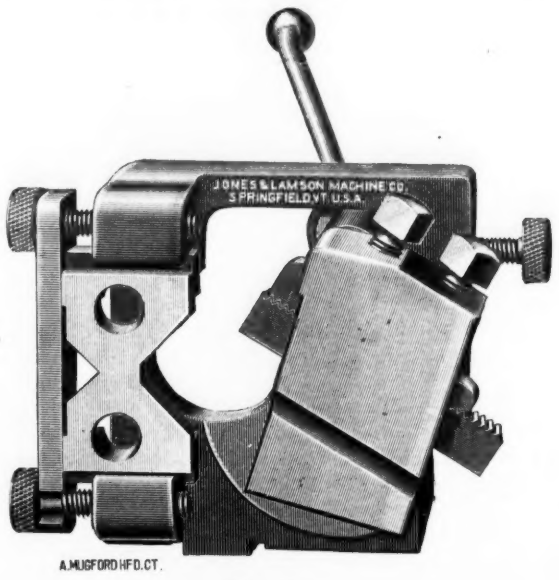


Fig. 2.

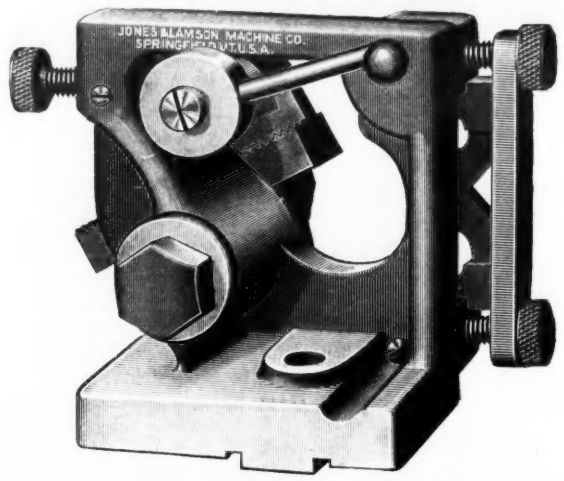


Fig. 3.

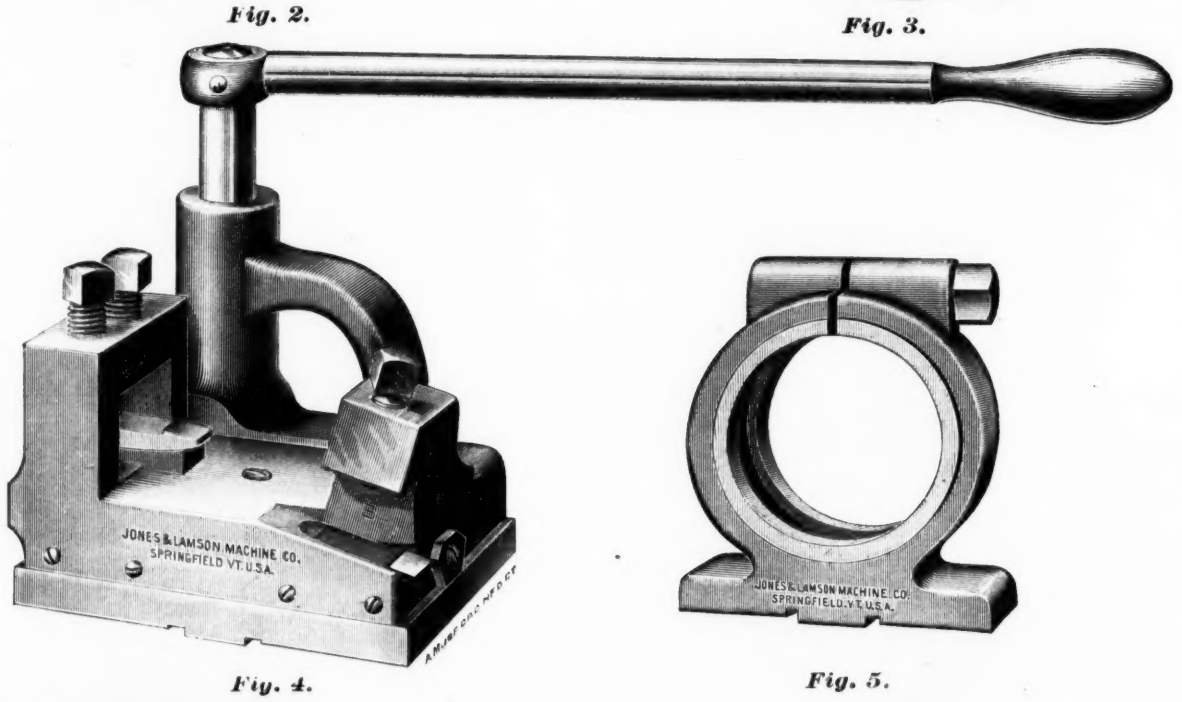


Fig. 4.

Fig. 5.

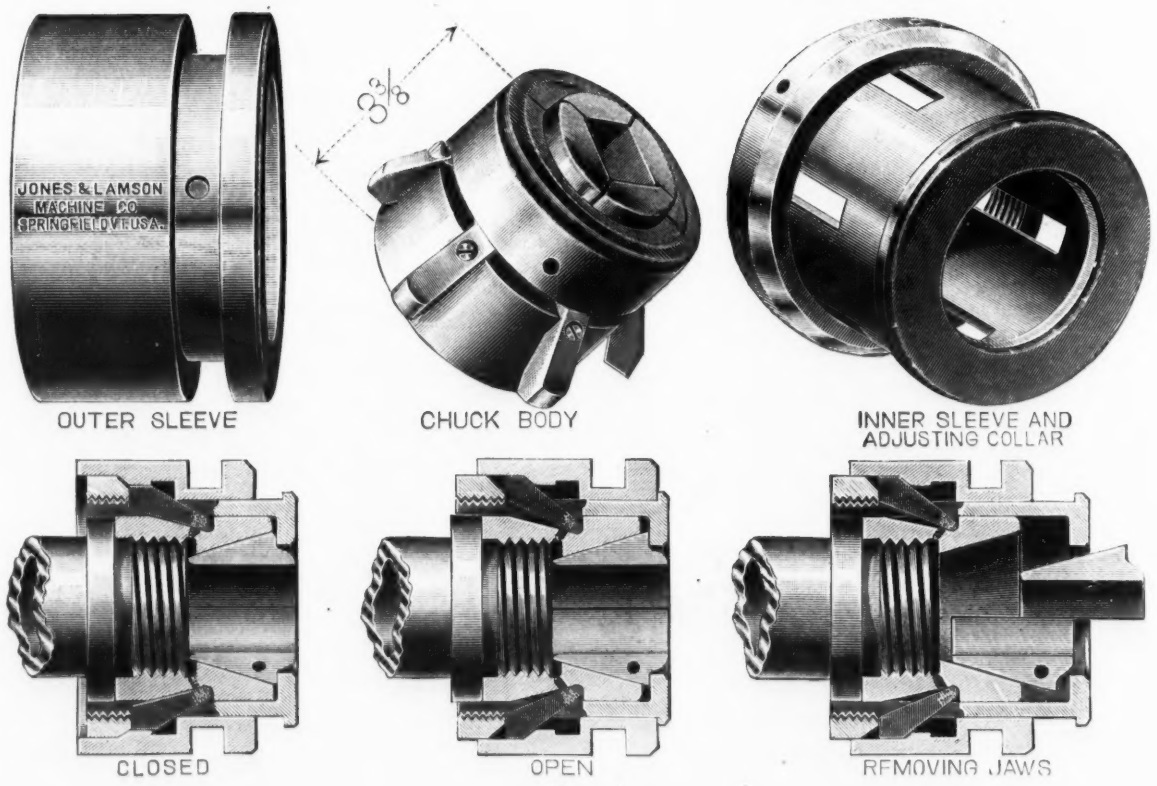


Fig. 6.

NEW TURRET HEAD LATHE.—SEE PAGE 1.

There is said to be a 5,000 horse-power electric motor in operation near London.

A determined effort is being made at Liverpool to institute a Board of Conciliation and Arbitration. The Local Trades Council favor the movement, and most of the older unions support it. But the shipping section mustered in force at the last meeting, and made a determined effort to thwart the movement. The fighting element want each union to stand by a strike policy, and not to consent to meet the employers to discuss grievances. As this element mustered in strong force, the progress made at the meeting was *nil*, but the more experienced members of the council say they will persevere. Some of the fighting members called a Conciliation Board "a Board of humiliation"; in this they exhibit a lack of experience and of self-reliance.—*Engineering.*

The account of a fire which played havoc with a village in the State of New York says: "The village had no fire department, and insurance rates were very high." Without saying anything about the loss by the fire, it would be interesting to know how much the increased insurance rates would have fallen short of maintaining the means of putting out fires.

Heavy Castings in Green Sand.

BY CHARLES SMITH.

Usually the trouble experienced in making large, heavy castings in green sand has been the difficulty found in keeping them from straining and scabbing. Whether such castings are molded in the floor or cast in boxes, the pouring head is of necessity high, and the high head causes a great strain on the bottom of the mold. If the mold is rammed sufficiently hard to resist this strain, scabbing is—or was, rather—usually the result. But in molding, as in other things, we are advancing, and now some of the progressive foundrymen in some of the large shops think nothing of making castings weighing from five to fifteen tons (complicated castings, too) in green sand. How do they do it? By getting the sand facing right, and drying the molds. Nearly every old shop of any pretensions has its little story of how some large mold, once made there, got away in the bottom while being poured; and the knowledge of the trouble experienced in getting that casting out of the ground, and the worry and cost in breaking it up for the cupola, has deterred many an ambitious foreman or mechanic from trying to make a large casting in green sand in the floor again. Dry sand and loam are resorted to, to bridge over. Work done in either dry sand or loam costs more than green sand work, and if, in these days of sharp competition, we find our neighbor is making large castings successfully in green sand, we can hardly afford to make castings of like nature in dry sand or loam.

In making a bed for the green sand work, intended to be molded and cast in the floor, first dig out the pit large and roomy, and of shape of pattern to be molded. Don't cramp yourself for room, and have to scrape off the sides of the pit to get room to move around, after putting the pattern in place. If the mold is intended to be held together with rods while pouring, place two timbers from 8 inches to 12 inches square, and of length sufficient to project at least 12 inches each side of the mold, across the bottom of the mold pit. About 6 inches from the end of each timber have a hole bored through, large enough to take a five-eighth, seven-eighth or one-inch rod, whichever you determine to use. Have these rods long enough to come high above the cope, to admit of passing through timbers crossing the cope, to assist in holding the mold together when being poured. Have threads cut at both ends of rods to admit of taking nuts and washers. These rods can be placed in position and rammed up with the nowel or bottom part of the mold as you come up in ramming. Gate from the bottom of the mold where practicable, and if the casting is

to be a heavy one—anything over three tons—have other gates on top also, and if a deep mold, have gates both top and center. This will prevent cold shuts. If the mold is an extremely heavy one, pour through a dry sand core, with gate opening through core, well blacked with a couple of good coats of liquid silver lead blacking; there will be a strong tendency for the parts around the gates to scab and cut, and the dry sand core, well blacked and dried, prevents this.

After the timbers are in position in the bottom of the pit, placed best to resist the strain on the mold when pouring, fill in with molding sand, and ram thoroughly, making this, your foundation, solid past all apprehension. When you have in a good solid bed of sand about 4 inches above the timbers, lay on this bed of sand a covering of a couple of inches of hay or straw, and on this straw place a cinder or coke bed, 4 inches deep; cover this cinder bed or coke bed with another layer of hay or straw, and you have an excellent chamber to catch or gather the gases forming around and below your mold when casting. From this coke chamber, leading to parts above the shop floor, and away clear of the mold, have pipes of sufficient size and capacity to take the gas from underneath the mold as fast as it accumulates or gathers whilst pouring. Good judgment must determine just how and where to place these pipes to best advantage.

Next put in from ten to twelve inches of molding sand above this last layer of hay or straw, and if you are going to make a straight bed to lay your pattern on, put in your straight-edges and make the bed hard enough to resist any strain that may come upon it while pouring. The bottom and corner edges of the mold must be rammed hard enough to resist the strain coming at these points; always have that in view when ramming these parts. Don't be afraid you will get it too hard. Of course, some judgment will have to be exercised, but it is astonishing how hard you can get the bed, and yet experience no trouble if the mold is properly vented and thoroughly dried before pouring. Before giving your bed the final finish, preparatory to putting in the pattern, take a good-sized vent wire and vent from your mold bed to your coke bed, and do this in a thorough manner. No tool to my mind is more essential to the successful production of good castings than a good vent wire. Use it freely when ramming up, keeping from two to four inches away from the pattern, and see that you keep up connection from your coke bed all the way to the joint of the mold. Many of the vents opening on the joint will become shut off on the joint surface during the finishing and securing of the mold, but your connections with the coke bed will keep that matter from troubling you. Ram away back from the mold solidly, that no license will be given that part of the work to give way, endangering the mold's surfaces or sides by spreading while pouring. When ramming along the pattern, never get nearer than three inches to the mold proper, but put your work in solid outside that limit. Just how to ram a mold is a matter that can only be determined by experience. No book is printed, no book will ever be printed that will give an unfailing formula that will work to a nicety. General principles can be given; experience and close observation must do the rest.

In mixing the facing for a green sand mold intended to be dried or skin-dried, the ordinary facing will not do. Enough clay must be added to insure a body to the surfaces when dried, and at the same time the clay forming such a close body, enough coarse or fire sand must be admitted to keep the facing porous. The clay in the facing also prevents the mold corners and parts from burning when being dried, preparatory to pouring. The clay used in facing should be well dried in the oven, pounded fine, and riddled through a No. 12 riddle. To two-thirds of new molding sand—very coarse—add one-third coarse loam or gravel sand, such as is used in loam molding. Mix these sands together, and to every seven shovels of the sand add one shovel of bituminous facing, and to every twenty shovels of the sand add one shovel of the powdered clay. If the nature of the sand you are using does not give you body and porosity with this mixture, add either of the parts until the sand has good body, and at the same time is very open. Place this facing against the pattern in the ordinary way when ramming up the mold.

After the pattern is withdrawn, the mold is finished and ready to be blacked; sometimes this is done with silver lead or mineral blacking rubbed on thickly with either the hand or brush, and sometimes it is blacked with liquid blacking. But before applying the liquid blacking, the mold is usually swabbed with light clay wash, molasses water or stale beer; any of these will do good work if the mold is afterwards dried. Heavy green sand work coated with molasses water or clay wash, and blacked with liquid silver lead blacking, insures splendid castings, if the mold is properly dried.

Usually, molds are dried with wire cages filled with burning charcoal, and held suspended in the mold. Sometimes bricks are placed in the bottom of the molds, tin sheets placed upon these bricks, and fires of wood, charcoal, and sometimes of soft coal, are built on these tins. Very often the molds are covered on top with large tins or plates, making a sort of oven of the mold while drying. The copes are usually dried by suspending them over the fires in the nowels. But any of these ways of drying are slow, and all of them admit of accumulating an amount of truck and dirt around a mold, that is discouraging; besides, there is the danger of burning one part of the mold before other parts are dry, and every one who has ever tried it knows the trouble drying deep pockets and flanges at their lowest parts. Drying molds with gas is now practiced. It can be done neater, cheaper, quicker and better than in the old way. Unscrew the burner of your gas pipe, and put on a half-inch rubber pipe. Have the rubber pipe long enough to reach all parts of your mold. To the end of the rubber pipe farthest away from the main gas pipe, attach a half-inch iron gas pipe two or three feet long; turn on the gas and light it at the iron pipe end. Take this pipe in your hand and let the gas flame play on the mold, into pockets, flanges, corners, everywhere on your mold you can go, and dry each part just as much as you desire. Be sure and get pipe and gas pressure sufficient to carry a stiff blaze. Green sand molds from twenty to thirty feet long, and weighing from eight to twelve tons, are dried with gas in this manner in less than three hours. Where there are many large castings to make, a skeleton of perforated pipes could be placed in the mold, the gas turned on and ignited, and the mold covered until dried, and often the cope could be lowered down on loose pieces set on the mold joint, and both cope and nowel dried at one operation.

Where large pulleys or wheels are swept in the ground, the inside part first being swept, blacked, finished and dried, and a segment placed against this inside part or core, with which to form the outside of the rim, many times the outside is of necessity made in loam or formed with dry sand cores, joined in a circle around the mold. This outside can be molded safely in green sand, by drying the surface in good shape with the gas flame, before pouring.

In casting heavy pulleys where the riser head is level with the top of the covering core, cover the opening through the covering core with paper (two thicknesses of flour sack paper will do), and on top of this paper place your riser sprue—covering the riser hole—and go on in the ordinary way; there will be no blowing through the riser while the mold is filling, and when it is full, the metal will burn through the paper, giving notice when to stop pouring, so as to avoid unnecessary strain. The flow-off on this riser can be low down, thus allowing the metal in the runner a chance to flow through the mold without much strain on the casting. After the runner is relieved, the flow-off riser can be covered, and the churning down on the risers prepared for that work.

Very often it is found, in ordinary work, bedded in the floor, that, through rapping the pattern down on the bed, that part of the mold will become so hard that you must either make a new bed, or take chances that your judgment warns you are against success. In such a case, go on and finish, and black your mold in the ordinary way, then lay pans or plates across the mold, and give it a good skin-dry. No trouble will be experienced from the hard bed.

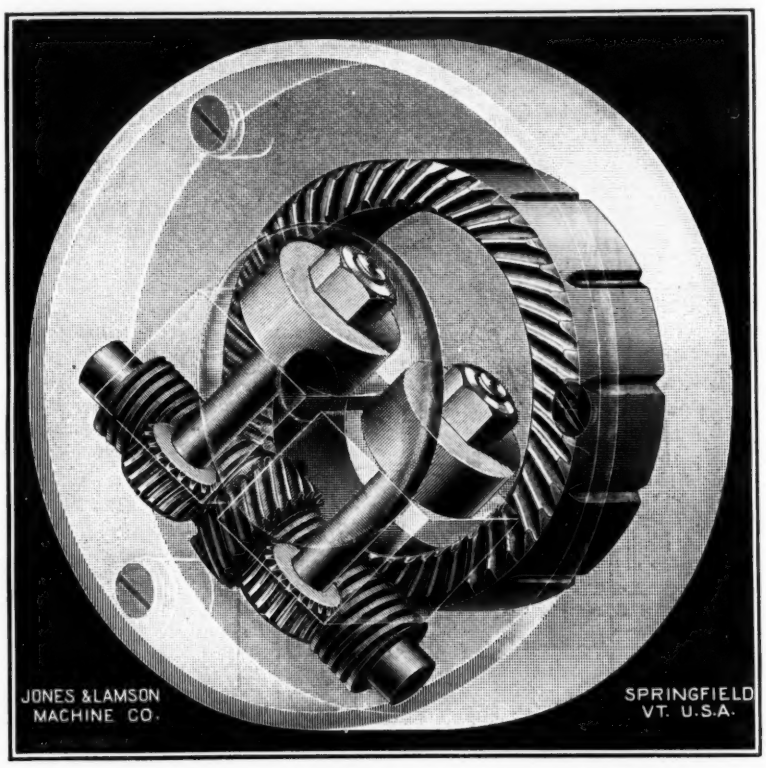


Fig. 8.

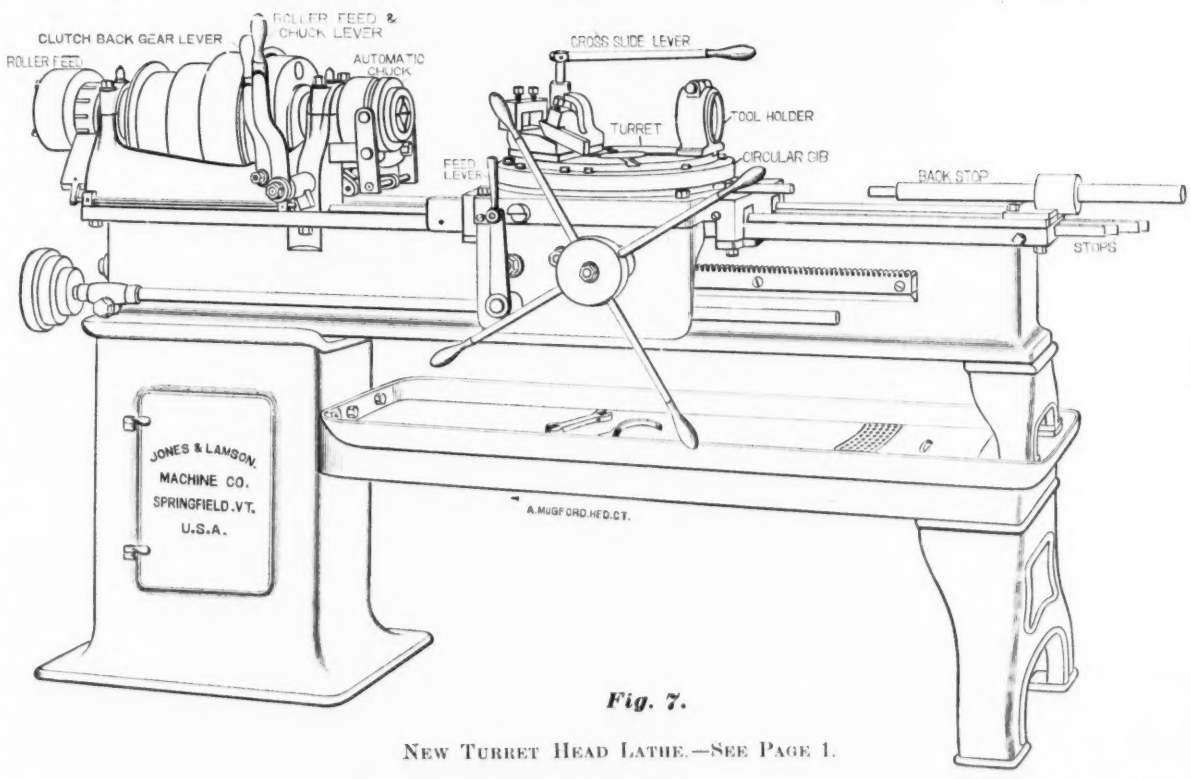


Fig. 7.

NEW TURRET HEAD LATHE.—SEE PAGE 1.

The Inman liner City of Paris is now in a fair way to being promptly reinstated upon active service between Liverpool and New York. Since the accident which happened to her machinery and hull, at the early part of last summer, the vessel has been laid up at Liverpool until quite recently, when she was taken round to the Clyde to receive new starboard engines and be generally refitted for sea. The City of Paris is now lying alongside the premises of Messrs. J. and G. Thomson, her builders, at Clydebank, and it is expected that at the present rate of progress she will be able to go upon her trial runs early in May. Entirely new starboard engines have been made, upon the same design as before, and her boilers are being fitted with Howden's system of forced draught, which, as we need hardly say, raises the temperature of the blast before admitting it to the furnaces. In most other respects the City of Paris will be fitted in the same way as before the accident. Every effort is being made, by working night and day on the vessel, to prepare her for taking her station on the Atlantic route early in the season. It is gratifying to both her owners and builders to note the recent excellent performances of her sister, the City of New York, which vessel, on her last outward run, covered a distance of upwards of 500 miles upon each of four days—a feat which, we understand,

has never before been accomplished in ocean navigation.—*The Engineer* (London).

New Engines for the Sound Steamboat "Rhode Island."

During the past winter the Sound steamboat "Rhode Island," belonging to the Providence and Stonington Steamship Company, has had a complete overhauling at the Morgan Iron Works, East Ninth street, New York. The extensive re-equipment of this well-known steamer places her in the front ranks of the Long Island Sound floating palaces. The most important part of the overhauling is probably the new compound surface condensing beam engine, which was built to replace the old engine. The new one was designed by Mr. Henry Levrat, superintendent of the Morgan Iron Works. It is the first engine of this particular type that has been constructed, and during a preliminary trial on the bay everything worked very satisfactorily, although the machinery was not allowed to work to its intended capacity, and the speed of the engine was not pushed above 20 revolutions per minute; but the results showed that the anticipations of her designer were fully realized. Our illustrations simply indicate the general arrangement of the machinery and boilers. The high-pressure cylinder is 64 inches diameter and 7 feet stroke; the low-pressure cylinder is 84 inches diameter and 12 feet stroke. Both cylinders are fitted with Sickles' adjustable cut-off. The low-pressure cylinder is connected to the forward end of the beam, as is usual in beam engines; and the high-pressure cylinder is connected to the after part of the beam in front of the connecting rod. With this arrangement the stress in the beam is distributed to the best advantage, the high-pressure cylinder is set on iron keelsons which form a solid foundation, and there is ample room left for an easy access to all the working parts of the machinery. The surface condenser is placed below the low-pressure cylinder. The paddle-wheels are of the ordinary type, 34 feet 2 inches diameter. There are two independent air-pumps *A*, shown in Figs. 2 and 3, and two independent circulating pumps *C*. These pumps are of the vertical, single-acting bucket type; the diameter of each pump is 30 inches; stroke, 18 inches. They are driven by a compound engine *B;* the diameter of the high-pressure cylinder is 11 inches, and that of the low-pressure cylinder is 22 inches; stroke, 36 inches. These pumps and engine were built especially for this boat by M. T. Davidson, of Brooklyn, N. Y.

The gallows frame is made of wrought-iron plates riveted together by angle irons. This frame is firmly secured to wrought-iron keelsons which are new, and were put in during the overhauling of the boat. They form a good foundation. The cylindrical boilers, five in number, were built at the Morgan Iron Works. Three of these boilers are double-ended, 20 feet long, with two corrugated furnaces in each end; two of the boilers are single-ended, 10 feet long, with two corrugated furnaces in each; all the boilers are 12 feet in diameter, and placed in the boat as shown in Fig. 3. They were built for a working pressure of 100 pounds; the aggregate grate surface is 390 square feet; and the aggregate heating surface is 10,000 square feet. The steam pipe *S*, Fig. 3, conveys the steam from the boilers to the high-pressure cylinder; the exhaust steam from this cylinder is conveyed to the low-pressure cylinder through the pipe *E*, which also serves as a receiver. The engine develops 3,500 horse-power; its weight is less, and it occupies the same or a little less room than the old engine of 2,000 horse-power, with a grate surface of 260 square feet, all of which is ample evidence of the advancement made in recent years in steam engineering.

There is a fire-room 10 feet 3 inches wide between the single and double-ended boilers. The forward fire-room, which is not shown, is 8 feet wide; it extends to the forward coal bunker formed by two bulkheads 6 feet apart; the forward bulkhead is made water-tight. At each side of the vessel a space 12 feet wide is left between these bulkheads for the blowers.

In addition to the main boilers there is a donkey boiler for supplying steam to all the steam pumps, hoisting engines and dynamos.

Besides the steamships undergoing repairs alongside of the pier of the Morgan Iron Works, there is now at these works in the course of construction a triple-expansion engine for the Pacific Mail steamship "City of Para," designed to develop 2,600 horse-power. The high-pressure cylinder is 28 inches diameter; intermediate cylinder, 44 inches, and low-pressure cylinder 70 inches diameter; stroke, 4 feet. Steam will be supplied by six boilers, 12 feet in diameter and 11 feet 6 inches long, having a total grate surface of 270 square feet, and 8,600 square feet of heating surface. The working pressure will be 160 pounds per square inch.

There is also in the course of construction another triple-expansion engine, designed for 800 horse-power, to be placed in the steamship "Morgan City," for the Morgan Line. The high-pressure cylinder is 17 inches diameter; intermediate cylinder, 27 inches, and low-pressure cylinder 42 inches diameter; stroke, 30 inches. This engine is fitted with the Marshall valve gear. Steam will be supplied by one boiler 14 feet diameter, and 12 feet 6 inches long. It will contain three corrugated furnaces, with an aggregate grate surface of 80 square feet; the total heating surface is to be 2,200 square feet. There will also be provided a donkey boiler 8 feet in diameter with 25 square feet of grate surface. This boiler can be used separately, or it can be connected and used with the main boiler. Both will be built for a working pressure of 160 pounds.

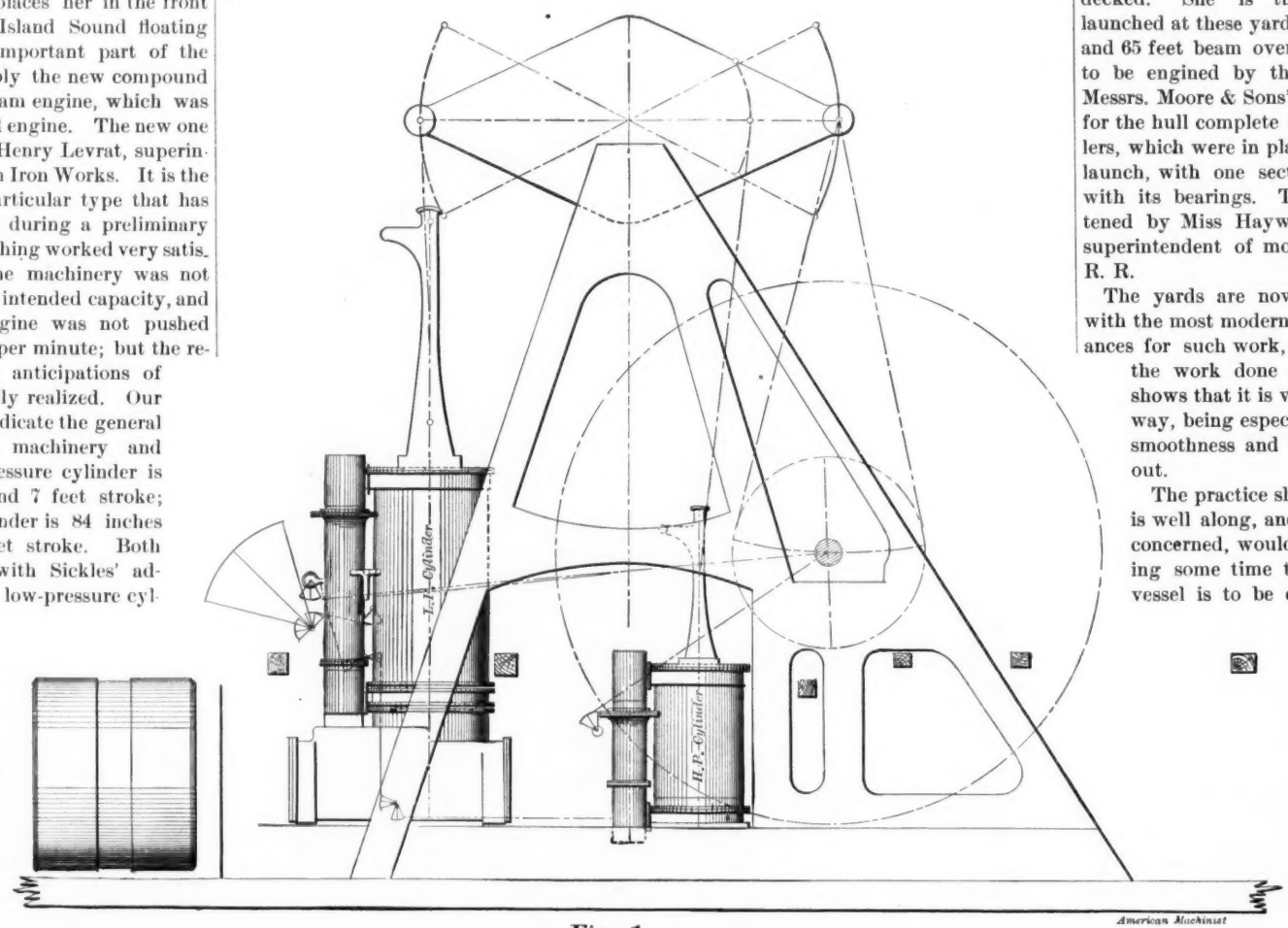


Fig. 1.

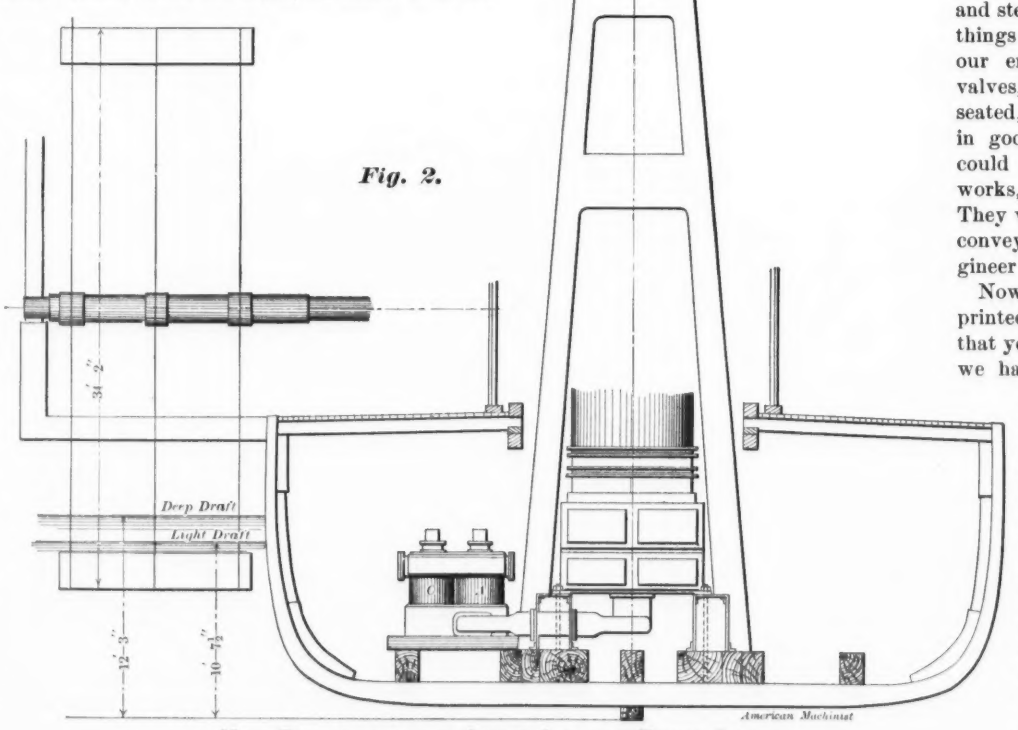


Fig. 2.

NEW ENGINES FOR THE SOUND STEAMER RHODE ISLAND.

Launch of the "Cincinnati."

On Saturday, the 25th of last month, the new ferryboat, the "Cincinnati," which has been under construction at the shipyards of Samuel L. Moore & Sons, at Elizabeth, N. J., was successfully launched. We have referred to this vessel before as being built for the Pennsylvania Railroad for the North River ferry service. She will be the first boat of her type, being a double-screw boat (with a screw at each end), and also double-decked. She is the largest boat yet launched at these yards, being 204 feet long, and 65 feet beam over the guards. She is to be engined by the railroad company, Messrs. Moore & Sons' contract being only for the hull complete and the screw propellers, which were in place at the time of the launch, with one section of shaft to each, with its bearings. The vessel was christened by Miss Hayward, daughter of the superintendent of motive power of the P. R. R.

The yards are now very well equipped with the most modern and approved appliances for such work, and an inspection of the work done on the "Cincinnati" shows that it is very creditable in every way, being especially noticeable for its smoothness and finish both inside and out.

The practice ship for the U. S. Navy is well along, and so far as the hull is concerned, would be ready for launching some time this summer, but this vessel is to be engined, and, in fact, completed at the yards, and it is the intention to put the engines in place before launching.

Now and Then.

The following brief extract from some remarks made by President Wm. H. Cronley, of No. 1, of New Jersey N. A. S. E., are to the point:

. . . . What advantages we have over the engineers of twenty-five or thirty years ago. Then if we had our boilers clean, connections clear, safety valves and gauge cocks and steam gauge in good order, we thought things all right about the boiler. And if our engine didn't thump or heat; if the valves, so far as we could see, were well seated, piston rings properly set out and in good condition, that was about all we could do. We had very few mechanical works, and fewer that we could understand. They were written for college students, and conveyed about as much meaning to an engineer as a Chinese wash bill.

Now, we have mechanical papers that are printed in plain English; printed in a way that you and I can understand them. And we have instruments that we know how to handle; instruments made purposely so that we can handle them. In a well-equipped engine-room to-day, we find an indicator. We apply it to the engine, note if the valves are properly set, speculate over the diagram as to the probable effect of a change in the setting, and try the effect of that change, if it seems advisable. The planimeter makes short work of computing the horse-power. We have the calorimeter, and we find by its use that the escaping gases from the boiler are carrying away too much heat; their temperature is too high—800° or 900°. We work to the end of reducing this temperature, getting it down to from 400° to 600°, and so save coal. How much better than the old way—pile on coal, plenty of steam, and a big waste. We have to-day the instruments to work with, books and papers, everything to make intelligent engineers of us. All we have to do is to make the effort. We have in our associations the advantages that come from organized effort to learn and to help one another to learn. These associations, avoiding all

entangling alliances, with knowledge for the watchword, are doing a grand work for us; doing more than any other single thing. Let us stand by them. Put the best men in front and uphold them. We have started the ball in the right direction; let us keep it rolling.

LETTERS FROM PRACTICAL MEN.

Justice and Design.

Editor American Machinist:

I was very much pleased to see, in the notice of the Warner & Swasey Works, that, in speaking of the boring machine, your contributor calls it a Bement machine. It seems to me that it is a very honorable thing to do. So long as it remains an undisputed fact that the machine was designed by Mr. Bement, he should have the credit of it as much so as if he had secured a patent and could enforce it. There must have been many another thing devised in this country more meritorious than many that are patented, for which the authors should be credited. And, too, this need not necessarily be confined to this country. There is a certain quick-return motion used on the Nasmith shaper, called the Whitworth quick-return, and it never detracted from the dignity of any builder to acknowledge that he used the Whitworth quick-return, nor would it detract from the dignity of any concern to honestly say that they build the Bement boring machine, the Lincoln milling machine, Slate drill, Jones and Lamson turret head machines, or any and every well-known device the author of which is known. Mechanics are not likely to get much more honor in this world than they deserve, and unless they give due honor to each other they are not likely to get it outside.

Another feature in your issue of April 23d excited my interest; that was examples of machine design. I fully understand that it is a question that the technical journals cannot well deal with, for the reason that they are in a measure—and a large measure—beholden to the advertisers; that is to say, possibly if a contributor questions the propriety of the eagle on the top of the upright engine, the makers might withdraw their patronage sooner than accept the hint, and save the cost of the eagle, even if all the world condemned its application, and agreed that the engine looked better with it off. And yet would not a free criticism of designs be a step in the right direction to secure the most desirable results? This is only what authors and artists have to endure; is it not what elevates their work, and is not machine designing a species of art?

There is this at least to be done: we may compliment the good, and in connection with this I would ask the reader to turn to page 11 of the number for April 23d, and note the simple stroke of designing where the continuity of the bed is broken at the head-stock. It has always appeared to the writer that men who can do such a thing as that can do other things better, if only allowed and encouraged in it. It was nothing but a departure from common practice in designing, cost nothing, and was suited to the case.

There are hundreds of other conventional things about our machines that will stand the same treatment to advantage if one has the courage to attack and the genius to wrestle with them.

Nothing can well be a greater departure from established forms than was the Corliss engine frame. How its appearance struck the old-time machinist probably few can now remember, but a better understanding of the fact that there is no more reason why an engine frame should look like an elongated pedestal than like a girder or anything else, except something well suited to its place, has brought about the feeling that, if not right, it is at least as right or nearer right than the old box, where one-half was useless except for show.

I think if designers in doing new work would only ask themselves the question: What is the use of making it like the old one? they would be led to finding the useless things that have been followed from habit, and so produce more reasonable designs, and, usually, improved ones. If it is not admissible to criticise each others' designs, one may slaughter his own, and those which have been handed down from our ancestors.

ALONSON AVERY.

Replies to Technic's Questions in Shop Ethics.

Editor American Machinist:

"Technic's" ethical jury without doubt will disagree on a verdict. However, circumstances in this, as in many other cases of a similar nature, will have a strong bearing on the case.

First we find that the person having charge of the "fourth floor" is a young man—and somewhat inexperienced. I shall take it for granted that he has been promoted to the position he occupies, and that he is doing his utmost to advance the interest of his employer, as well as that of his own reputation, as an efficient official. Evidently everything would have gone on smoothly had it not been for the small vent hole in one of the stop-cocks. The question arises, who ordered a stop-cock at this particular place with a vent hole in it? Was it the young man in question, or some one else? If it was he who had it placed there, then I hold that he is morally and legally responsible for the extent of the damage done, for he is employed for the purpose of having such and other matters attended to carefully, and to guard against loss to his employers. The mere fact that he was conducting his part of the business for small wages has no bearing on the case.

Suppose this same man was a fireman, and by neglect allowed the water to go too low in the boiler, and by "mistake" he tried to get it up again (improperly); result, an explosion, several persons maimed, and some killed; large damage to property. If he failed to get killed by the explosion, would he be held or considered responsible?

It will be said that the wages Technic's young man received would not justify his repairing the loss. That may be so, but he is morally responsible, all the same. He was employed and paid for attending faithfully to those duties.

Frequently we find men who are too careless about their employer's goods or property. I have heard of the man who bored the head-stock spindle until the face-plate and the piece he was boring all fell on the floor.

I have known a man through gross carelessness to strip and break a set of change gears on a lathe; he looked on it as a matter of course. Three new gears were ordered from the maker of the lathe. The holes were small and hubs too long. As the foreman did not charge the man for the damage he had done, he gave the new gears to him to fit to place. The time card came in the next morning from this man with three hours time fitting new gears to No. 12 lathe. This made the foreman mad, and he discharged the man for his carelessness in the first place.

Another instance in a different shop. I saw a man turning a 6-inch shaft about 10 feet long. When he was about to take it out of the lathe he thoughtlessly loosened the tail-stock spindle before blocking up the shaft; result, broken steady rest. A new piece was cast and given to the same man to fit up. The time card came along next day, 10 hours fitting up steady rest for No. 15 lathe. This did not go down smoothly, and he was charged up with the whole matter at cost, as a reminder of his negligence. Had those two men admitted their fault, and expressed a willingness to be fair in the matter, it would probably have been better for them.

Returning to the point at issue. The young man who is the subject of this discussion evidently caused some damage by his neglect. His employer, wishing to impress upon him the necessity of being more careful in future, makes him pay one hundred dollars for the damage done, and if the extent of the damage was justly estimated, I see no moral reason why he should not pay it. But he made another blunder in giving his note for $150, being $50 more then the amount of the damage. As he gave it without due consideration, and also without *value received*, I hold that said note is null and void.

In answer to 3d paragraph, I claim that the employer oversteps his ground in protecting himself, and is guilty of extortion.

As to the 4th paragraph, I believe the employe is justifiable in refusing payment of note when due, but morally bound to make good the damage done by his negligence, less the amount he would use (providing $100 would be enough) in defending himself, in case the employer brought action for recovery of the note. Would it not have been better to have settled honestly in the beginning, and *keep the lawyers out?*

MACHINAL.

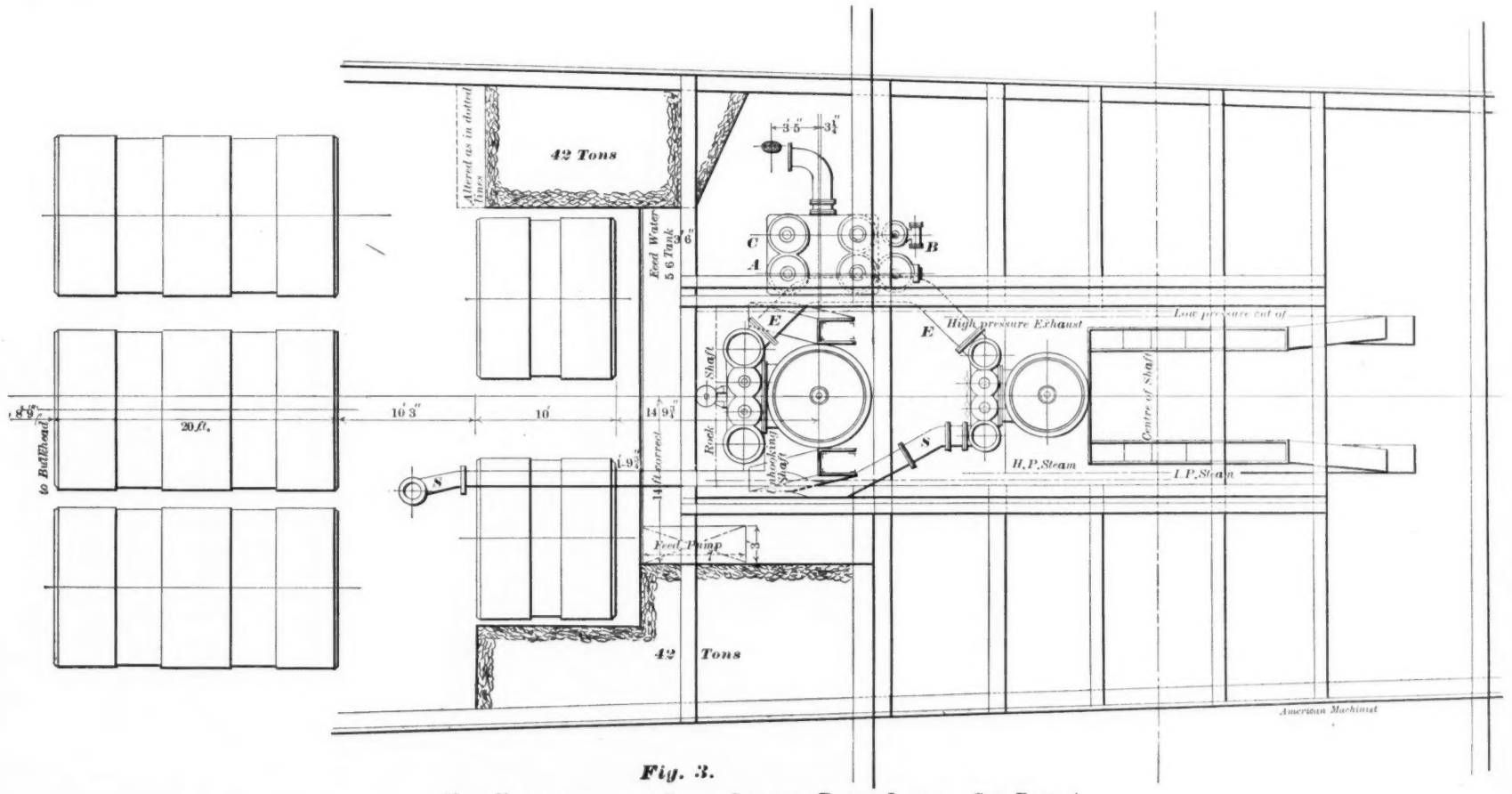


Fig. 3.

NEW ENGINES FOR THE SOUND STEAMER RHODE ISLAND.—SEE PAGE 4.

Editor American Machinist:

In reply to "Technic's" article on shop ethics, it is evident the case quoted is an exception; few employers would take advantage of a workman under such circumstances. It is a law of usage that small wages means small responsibility, and less liability.

It is unreasonable to hold a man financially responsible, and, at the same time, pay him only enough to economically subsist on.

It is unjust, as all business is run with due allowance for loss caused by ordinary carelessness, accident or bad material, and the employer has already made good the loss either by small wages to employes or higher price to customers.

It is extortionate, as the unreasonable charge for extra time shows.

In such cases, reparation, if any, should be voluntary, and the amount gauged more by the ability to pay than the damage done.

If the young man had by some slight act saved his employer from losing $100, he would not be justified in demanding that amount; this is the same thing reversed, and whatever his legal liability to pay the note given may be, he is certainly under no moral obligation to do so. CO OPERATOR.

Editor American Machinist:

In your issue of April 9, "Technics" asks some questions in shop ethics. I will answer as follows:

Question 1. No. A wage worker, not being a participant in the profits of the business, is in no sense responsible for accidental neglect.

Question 2. No.

Question 3. According to the facts set forth, the note contains extortion to the amount of $50, even if the claim was valid, and would void the whole obligation if it occurred out here in Wisconsin.

Question 4. He would; and more, he would be morally bound to refuse payment.

SAMUEL LUGG.

Editor American Machinist:

I was much interested in "Technic's" young man who gave his note for $150. Did the young man plan this pipe job, and was his plan carried out in putting in this vent hole? If so, he was to blame. But if the proprietor had this pipe put in in this way, and the young man knew nothing of it, the proprietor alone was at fault. It looks like a cheap job, and likely to make trouble. Why was there not a float put in the tank to operate the valve? Make it too costly for the proprietor? Then he is to blame again.

This was a young man not paid for past experience, which looks as if the proprietor calculated to take the risks himself of having things right. At any rate, he did not pay for experience, and had up to this time pocketed the money that should have been paid to a man of experience, and therefore the blame rests on him. In case I was one of twelve jurors, the young man would not be guilty to the tune of $150.

SHELDON F. PAYNE.

How Long it Takes to Make a Good Machinist.

Editor American Machinist:

I have been much interested in the trade school articles by Prof. Sweet, and later by P. H. Bullock. I agree with the latter gentleman that a good machinist can be made in less than three years. I don't believe every young man can be made into a machinist in that, or any other length of time, but I believe likely young men can be made into good machinists about as Josh Billings believed in the universal salvation of man: He believed it, but *he wanted to pick the men.*

I once had a young man work for me somewhat on the plan detailed by J. A. Gilkerson, in his communication headed: "An Industrial University." This young man wanted a job badly. There were particular reasons why he should be earning good wages, and he made an agreement with me to be paid just what, in my estimation, he earned each week—except for the first—for which he was to receive $4; just enough to pay his board.

It never seemed to trouble this man to learn. His mind was on his business, and his whole heart in it. I fully believe that half the kinks and makeshifts employed by old lathe and planer hands were re-invented by this man as needed by him. He used common sense, backed up by good brains, and in less than six months was worth journeyman's wages to me—and he got it.

There is a good deal of difference between being a good machinist and "knowing the machinist's trade thoroughly." I have been in the business thirty years, but don't know it thoroughly yet, and don't ever expect to; but I hope I was a "good machinist" twenty-five years ago. There is so much that is new constantly coming up, that one man cannot grasp it all. The best one man can do is to be called a "thorough machinist," which means that he is able to study up ways and means for well and economically doing such work as falls into his hands. Give him a forging or a casting, and a drawing, and the thorough machinist can see in the rough metal the finished work, just as the sculptor can see the perfect statue in the rough block of marble, and knows just how to strike with mallet and chisel to bring out the perfect work of art. Just so the "thorough machinist" can see the finished work, and his machinist's instinct and training tell him how to set at work the shop tools to get out of the rough iron the finished work.

And so it goes; some young men can make themselves into good machinists in six months, some in twelve months, some in two or three years, and some will never get there with the traditional seven years' apprenticeship, and had better do something else. But of all the different kinds, give me the six months man. He is the one who was "born a machinist," and he will continue to learn and become more valuable all his life.

JAMES FRANCIS.

Punching and Shearing Malleable Iron.

Editor American Machinist:

The present, I believe, is called the iron age, and we may almost call it the "malleable iron age" when we look around and see the variety of uses to which malleable iron is put. Perhaps it enters into the construction of nothing more than into railroad car work, and possibly the few words I may write may be of use to some of our readers.

Some time since I was standing with our master car builder near a quantity of "corner irons," malleable metal ¼" thick, which was needed in the erecting shop, but each one required four bolt holes drilled first. I suggested they could be punched; the man working the punching machine was told to try one, at once. The result is they have been punched ever since.

One day later, in passing, I noticed the operative had advanced considerably, for I was surprised to see him with several small castings (malleable) at the shears cutting off a part of each—a piece about one-half inch thick by one and a half inch wide. When asked if there was not danger of breaking the machine, he thought not, and felt quite proud of the job. When we consider that scarcely any casting is malleated only on the outside, whilst the middle part remains unchanged, it is not safe to venture too much.

We use ferrules of the above metal for file handles about one-twelfth of an inch thick, and in breaking one I found only one-third of the whole thickness each side changed. It has been tried here for wrenches, but with indifferent success, the jaws being soft, whilst the stems are too weak and brittle to stand the strain.

WM. NEWTON.

How Shall He Build His Tool Chest?

Editor American Machinist:

I notice in your issue of April 16th that one of your correspondents, Mr. L. W. Franklin, would like a design for a tool chest. The enclosed sketches represent a convenient chest suitable for a tool maker or machinist on small work, and may be of assistance to Mr. Franklin in making his selection. I have found that a tool box can be too large as well as too small, but the question of size depends largely on the nature of work engaged in, which latter determines size of tools.

My experience was to get the first one too small. It was made out of a sewing machine cover, and I had to saw off the handle of my large hammer before it would go in the box.

As my tools accumulated I saw that I had made a mistake in the size, and just about the time I realized my mistake, another cub thought he wanted my box, and offered a lot of tools if I would swap. We swapped, and he had a box with no tools, while I had the tools and no box.

My next tool chest was planned about the same way some people plan a house—it may be too big now, but it is a good thing to have plenty of room for future accessions.

During the three years I had this big box it became a regular nuisance. My tools didn't occupy half of the space, so gradually my best lathe and planer tools found their way into the box; then planer parallels, flat drills, odd liners, bolts, washers, set-screws, bits of brass and steel, lathe dogs, and all those conveniences which a man wants to have handy, and which he must hide or lock up lest some other chap should get them.

As a convenient receptacle for all things needful this box was a decided success, but as a machinist's tool chest—where his small tools ought to be accessible—the success was wanting.

My experience thus far with tool chests led me to believe that one ought to have a medium-sized tool chest for his personal tools, and a good sized drawer with lock (and key) for those accumulations referred to above, so when opportunity offered I sold chest No. 2, and had another made, the design of which is here given. The leading dimensions of this chest are 18″x11″x11″ outside measurements, or 19″x12″x11″ if we include the ½ inch strengthening strips around the top and bottom of box. The lid is made one inch deep inside, which will form a good place for the larger try squares and straight-edges if suitable strips are nailed to the cover to secure them in position. A shallow till 1¼″ deep by 4½″ wide arranged to slide in the upper part of the chest will be found convenient for those tools which are not so frequently in use.

The body of the chest (upper part) is intended for the larger hammers, monkey wrenches, screw-drivers, hack saw, surface gauge, and any large tools which it may be desirable to keep in a tool chest. In the lower portion are three drawers, as shown, which will be found convenient for the ordinary every-day tools. If one has a good outfit one of the upper drawers could be reserved for calipers and dividers; the other for gauges—wire, drill, micrometer, screw, center gauge, depth gauge, etc., and the lower drawer, divided conveniently into four compartments as shown at Fig. 4, could be kept for scales, small try squares, center square, bevel gauge, protractor, center indicator, etc., and small drills, taps and reamers. For the fine tools the drawers should be lined with felt or other suitable material, which will also add much to the appearance of a well-kept tool box.

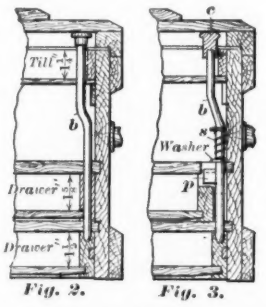


Fig. 2.

Fig. 3.

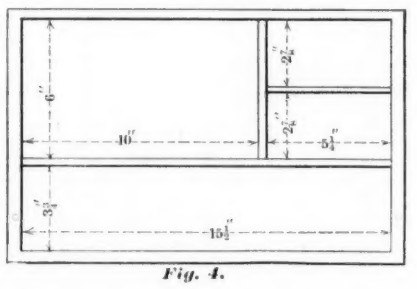
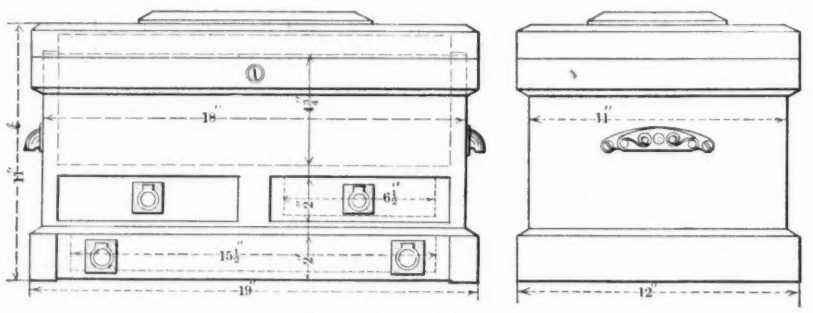


Fig. 4.



CHIP'S TOOL CHEST.

A good point about the locking mechanism is, that one lock fastens the lid and all the drawers, thus avoiding the use of four keys. Two bolts *b*, one on each side, towards the front, pass through the upper and into the lower drawer, as shown in Fig. 2, and can be removed by opening the lid, which is secured by a Yale lock. The bolts project through to underside of lid, which feature always insures the lower drawer being secured when the lid is closed, provided the bolts have been inserted. A shorter wire would hold the upper drawer, but might not seat every time in the lower. The cleat for sliding till does not extend to the front, so the bolt is readily withdrawn; the bend in bolt is only for convenience in handling.

I saw a chest made after this design in which the bolts were not withdrawn—the upper drawer in this case being narrower, and the bolts so arranged that the end fitted into a hole in the side of the lower drawer, and a projection *p* on bolt dropped into a recess in the upper drawer, the latter being placed sufficiently far from the side of the chest to allow bolt to pass freely. This arrangement will be better understood by referring to Fig. 3. When the lid is opened the spiral spring *s* lifts the bolt, and the drawers are free. To allow the lid to be closed without locking the drawers, the bolts are cut a little shorter than the top of the box, and a loose cap *c* forms the head; when *c* is removed the bolts are not of sufficient length to be forced into the drawers when the lid is closed. The cost of a box like this, made of walnut, fitted with brass handles, drawer pulls, and lock (excepting side bolts), was $13 for material and labor.

CHIP.

Editor American Machinist:

I noticed the inquiry of L. W. Franklin how to make a tool chest. I may not know the "best" way, but I have a chest about 24″ long, 15″ wide and 12″ high in side, that I think is good. It does not open at the top, but the lid is hung on the bottom of the front. It is full of drawers which shut close together; they are 24″, 16″ and 8″ wide; all are 15″ deep (horizontally) and their vertical depth varies from ¾″ to 3″. The sides of the drawers are grooved, and slide on pieces let into the sides of the chest. Most of the drawers have blocks in them the form of the outside or inside of the tools which lie in them, which serve to keep the tools in place. Each drawer forms a cover for the one below it, and the chest may be turned bottom up without displacing any of the tools. Every tool is reached by pulling out its drawer, and a vacancy is easily noticed.

The pulls are formed by boring one or two 1″ holes 2½″ apart, nearly through the fronts of the drawers from the inside, and ⅛″ holes the rest of the way, and sheet metal plates fastened to the inside to cover the holes.

Chests made in this way hold a large number of tools and material, and have no trays to be taken out and returned.

JAS. H. WELLS.

The above question, in your issue of April 16, is one which has bothered many of us before, and perhaps will bother many more who come after us. Now I am not going to try to answer that question directly, but will give Mr. Franklin something to think about. After many years through which I had lugged around my draftsman's kit, sometimes in a paper necktie box, or a cigar box, or some other kind of receptacle into which I could throw them when through using, and from which it usually took two or three minutes to fish out anything I might want, I came to the conclusion I wanted something handy. So, after thinking a while, I brought forth the box which the illustration pretty fairly sets forth. I give this with the hope that he may be able to think of something that will be handy. I also hope when he thinks of something handier, that he will give it to the boys.

Now this is not a machinist tool chest, but

a draftsman's; but I think a machinist or any other mechanic's tool chest built on this plan would give satisfaction. As will be seen by the picture, it is only a chest of drawers, with a cover and a front flap, which lets down in front.

The top till is made solid with the body of the box. In this till I keep my calipers, and such machinists' tools as a draftsman sometimes needs. Directly under this till I have a drawer in which I keep my drawing instruments; this drawer is shown in Fig. 2.

You will see there is a place for about everything a draftsman constantly uses. The sides and back end of this drawer are $\frac{3}{8}$" high, the front and partitions $\frac{1}{4}$" high. The next drawer below is $\frac{3}{8}$" high, and used for triangles, in which there is room for four sets of three each, viz., 10", 8", 6" and 4", 45°, 30° and 22.5°. The drawer below this is $\frac{3}{8}$" deep; this I use for my irregular curves, which consist of a set of nine mechanical curves. The next is $\frac{1}{2}$" deep, in which I keep a miscellaneous collection of curves, triangles, protractors, and such things as we use for special jobs. The next drawer is 1" deep, and was made to hold Patent Office bristol boards; the drawer for writing material is also 1" deep, and the drawer for books is $1\frac{1}{2}$" deep. In this I can keep Haswell, Trautwine and two or three other thinner books. The bottom drawer is 4" deep, and it has an open front, but the top of it is a till $\frac{3}{8}$" deep; in this I keep colors, brushes and kindred material. The lower part is divided by a partition, the smaller space being only 4" broad. In this I keep my ink and color saucers. In the larger space I keep some handy catalogues, such as are usually required for reference.

The whole thing, in size, is about 11"x17" x10½", and when it is closed, locks with one lock. The convenience of this case is apparent; it is only necessary to pull out a drawer and take out what you want, without hunting. It saves time, and wear and tear of tools and finger ends.

I usually pull out the instrument drawer and set it on the table, so it is always handy to lay an instrument into its place, when through using. The entire box is made of tin, and the pulls are wire rings, but there would be no trouble to make one of wood.

GEO. GUNTZ.

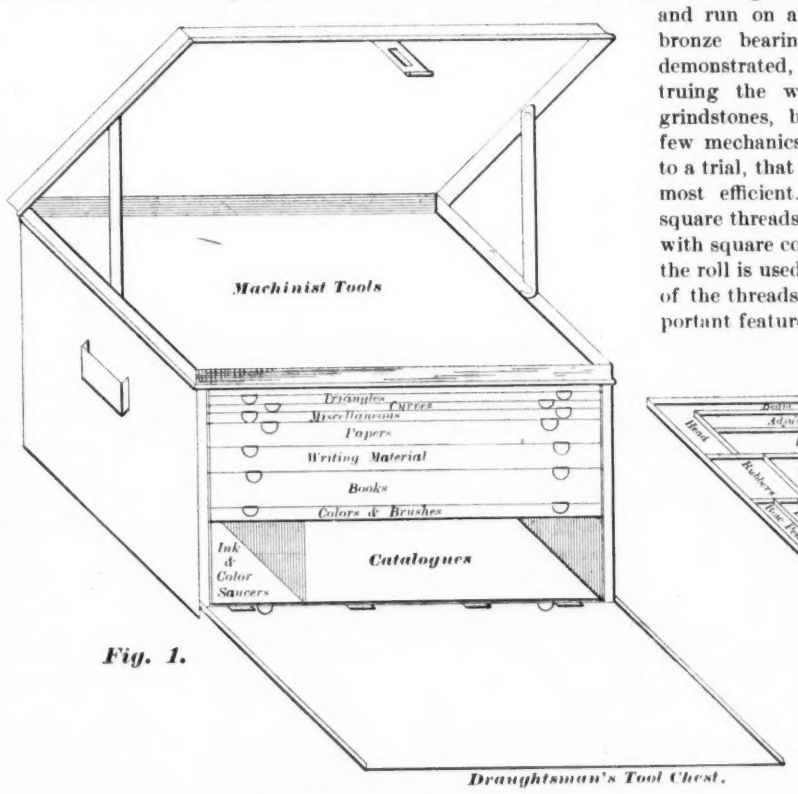


Fig. 1.

TOOL CHEST BY GEO. GUNTZ.

Overhead Rights.

Although any one may extend an overhead wire across or along a street, it does not seem generally known that no wire may pass over a house without the permission of the proprietor, even though the wire be in no way connected with the house. The owner may, if he pleases, take them all down, for his freehold extends from the center of the earth up to the sky. This is a principle that is not generally understood, but occasionally a householder is found who knows his rights and will not allow them to be infringed. Such a person was the landlord of a large boarding-house on Beacon Hill, who made the electric light company provide bulbs for the lighting of his dining-room in return for the privilege of stringing wires upon his roof. Few persons are so well posted in the law as to know what their rights are, and it is an object with large corporations to keep them in ignorance.—*Boston Courier.*

William H. Weightman, consulting engineer, has removed from Para Building to 29 Broadway (Columbia Building), New York.

Detroit Shop Notes.

(Editorial Correspondence.)

One of the newest enterprises of the city of Detroit is that of the Leland, Faulconer & Norton Co., who are preparing to put something new on the market in the way of machine tools and special machinery. In the firm are mechanics and engineers who have a thorough appreciation of what good work means, with the ability and determination to do it. Messrs. Leland and Norton were both, until recently, connected with the Brown & Sharpe Manufacturing Company, the former as traveling representative and expert, the latter as designing engineer. Both are enthusiastic mechanics, who are evidently interested in mechanical matters because they cannot help it—being "built that way." Their shop is in the top floor of the excellent stone building in which are the machinery store and warerooms of Charles A. Strelinger & Co., Mr. Strelinger being interested in the new venture, which has already met with such a measure of success as to make it probable that the rest of its career will be comparatively plain sailing.

THE TOOL GRINDER.

Naturally, one of the first things that attracted my attention in the shop was the tool grinder which we illustrated and described in our issue of March 12. A special study has been made of the problems involved in the construction of a satisfactory machine of this kind, and all the arguments that were brought up in these columns for and against the emery tool grinder during the discussion of the "Emery Wheel *vs.* Grindstone" question, with others encountered elsewhere, were carefully considered. It was believed that the reasons why the emery wheel grinder was less efficient than it should be for such work had been discovered, and the object was to overcome the difficulties. The machine running in the shop has an emery wheel at one end of the spindle and the best imported grindstone at the other. They are the same size, and, of course, run under precisely the same conditions. The men who had grinding to do while I was in the shop uniformly chose the emery wheel, and I was told that it was always so, though some of them were at first prejudiced against the grindstone, and the emery wheel had to fight its way against this prejudice. At the time our illustration of the machine was made there were a dozen or more of them in stock that have since been sold and placed in various shops. I saw a number of them in use during my travels, and though I believe myself that a good grindstone, properly mounted, run at a proper speed, and properly taken care of, is much more efficient for such grinding than it is generally given credit for, I was convinced that it at least has a vigorous competitor in this machine, which, even if the grindstone is to be used, is a most excellent mounting for it. Great importance, however, is attached by the builders to the emery wheel that is used on the machine, and Mr. Norton, who seems to possess an almost inexhaustible stock of emery wheel lore, says that the main difficulty is in the fact that proper wheels are not usually selected, and especially that for grinding of this kind the wheels usually selected are entirely too hard to do efficient service, and that a very little variation in this respect either way will make the difference between a wheel which will beat any grindstone out of sight and one which will not do anything of the kind.

THE WHEEL TRUING ROLL.

One of the most interesting things about this machine to me was the roll by which the wheels are kept true, and the curious form it has assumed by a tentative process. It is about 2½" in diameter, and is cut with a square thread 12 to the inch, the threads being about $\frac{1}{32}$" wide and $\frac{3}{8}$" deep. Machinery steel is the material used, and, as will readily be perceived, the threads can be very easily deflected by side pressure on them with the fingers. They are case-hardened, and run on a steel arbor in phosphor bronze bearings. As can easily be demonstrated, they are very efficient in truing the wheels, whether emery or grindstones, but it is safe to say that few mechanics would suppose, previous to a trial, that such proportions would be most efficient. The philosophy of the square threads seems to be that the form with square corners is maintained until the roll is used up, but the lateral spring of the threads is, of course, not an important feature, since the rolls are found to be as efficient when nearly worn out as when new, and the spring must necessarily be less as the threads are reduced in height. The essential points seem to be in the relative pitch and thickness of thread, though it is believed that these would need to be changed for different conditions in other respects.

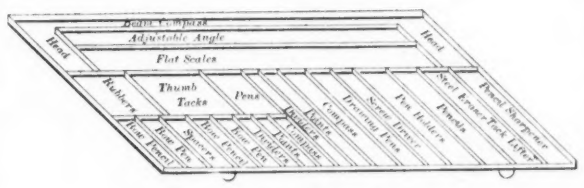


Fig. 2.

THE LATHE *vs.* THE GRINDER.

The shop is, of course, equipped with the best of tools in the way of universal and surface grinders, milling machines, automatic gear cutters, etc., besides the primary machine tools; the grinders and milling machines being the latest productions of the B. & S. shops.

An excellent method is taken for showing the difference between ordinarily good lathe work and grinding, for the benefit of those who are not familiar with the comparative accuracy of the two kinds of work. There are two taper plugs which are about the size and proportions of the centers of the ordinary 15" lathe. They each have knurled handles, and are fitted to internal gauges or receivers of equal length, these being knurled on the outside. One of these receivers has been reamed out and the plug fitted to it in the way that such work is usually done by the average first-class lathesman. When the hole and the plug are wiped off clean, and a streak of marking, composed of fine Prussian blue, is drawn along one side of the plug, it is put into the receiver and turned around in it so as to distribute the marking. When taken out, the plug is seen to be what would be called a good job of fitting, the marking being well distributed, but still considerably heavier in some places than in others, or with streaks running around the plug, showing that the bearing is not precisely uniform all over. The other plug and its receiver are both ground on the B. & S. universal grinder, and when a narrow streak of the same marking is put on this plug in the same way, and the plug turned within its receiver as before, the marking is so evenly distributed over the entire surface of the plug that no irregularities can be detected, the bearing seeming to be absolutely uniform. The difference between the fit of the two jobs is very striking and suggestive, and it is a very good object lesson as to the relative value of lathe work and grinding for journals of fast running or fine machinery.

HIGH SPEEDS AND BALANCING.

For such a piece of work as the new internal grinding attachment for the B. & S. universal grinder, for instance, it is safe to say that only by grinding is such a machine possible, its spindle, running at 18,000 revolutions per minute, being absolutely dependent upon the most accurate fitting and truth. In connection with this matter I may mention an incident related to me by Mr. Norton, which shows the importance of little things when such high speeds are made use of. The pulley used on this attachment is made of a substance which is mainly paper, and which was used largely for thrust bearing collars, until it was found that the pulp for the material was ground off by grindstones, which left just enough grit in it to rapidly cut out any metal with which it came into contact. It makes a good pulley for this purpose, however, and was secured to the spindle by a small screw, which passed through the pulley down to the spindle. In the first machines built this spindle was found to wear out of truth much more rapidly than it was thought it should, and finally it was noticed that the wear took place on the side next this screw, indicating that the difference in weight between the screw and the material removed by drilling for it was sufficient to cause uneven wear by reason of being slightly out of balance, though there was no other indication of lack of balance. Two screws were put in diametrically opposite each other and the difficulty vanished.

CASTINGS.

One of the difficulties the new concern has had to contend with, but which they have now for the most part overcome, is in the matter of castings, it being found very difficult to get the kind of castings made in Detroit that they consider necessary for the kind of work they are doing, the result being that they have had some reason to regret that they did not start a foundry of their own at the beginning. In this experience there may be a hint for new concerns starting in business in places where they propose to do a class of work not previously done there, for it is to be remembered that Detroit is something of a manufacturing city and that a great deal of very good work is done there in other lines, the stove-plate molders being especially numerous and skillful in their work, while there are also car shops and marine engine works.

Several new things in the way of tools are being considered, and in due time will doubtless materialize and be made the subject of illustrations in our columns, so that it would be premature to mention them in detail now; but it may be said that there is every indication that original thinking is to be done on what is built, and that very little is to be done simply because others have done the same thing.

A NEW HOB.

Considerable jobbing work is done by the new firm, and in connection with this I noticed a method of cutting worm wheels

(*Continued on page 10.*)

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Naval Experiments.

There is perhaps nothing into which so much money is going, in the way of untried experiments, as into the navies of the world. Money is spent without stint upon all forms of naval vessels—vessels embracing the theories of naval architects—yet no one knows with anything approaching certainty what the fate of these vessels would be in actual engagement. Their steaming qualities can be ascertained, and their behavior at sea can be pretty thoroughly tested, but how they would stand the poundings of hostile shot and shell is in a great degree a mystery. There is no opportunity to actually test this, and it is, of course, to be hoped that there never will be. In fact, just what effect upon a modern warship the continued discharge of her own guns would have, is largely, in most cases, a matter of conjecture. The cost of finding this out in the instance of heavy modern guns is too expensive a luxury; not alone the cost of each discharge of such a gun—quite a fortune in itself—but the fact that these guns will be condemned as unsafe after a limited number of discharges.

The building of naval vessels is very much as if a manufacturer should build a thousand large steam engines—more or less—new in design throughout, embracing features never tried, before thoroughly testing one.

But in the present temper of the nations of the world, formidable navies are necessities; at least those supposed to be formidable. Every war vessel that is added to our own navy gives an American a little greater sense—if not exactly of security, at least of the country being able to keep along in point of independent dignity with other nations of the earth. There is perhaps no single important measure in which Americans are so nearly in accord as upon the advisability of expending the money necessary to provide a respectable navy without unnecessary delay. This and better coast defense are questions that do not seriously divide public opinion. Fortunately, there is no room here—always supposing the necessary money is judiciously expended—for political division.

After all, and this is very satisfactory—great navies are not built so much for use as they are to do away with the occasion for their use. The country that is prepared for war is not likely to have war thrust upon it. And until there is a change in human affairs, a change not imminent, the country that is unprepared to defend its rights is unfortunate. We may deplore the necessity for the expenditure of so much money in preparation, but such expenditure is in the interest of peace. This is not the age of great naval heroes; it is the age of great engineers, who plan and construct warships, unwittingly sometimes, to the end that there shall be no fighting for them to do. Such men are peacemakers, whatever their intentions.

While it does not appear necessary that this country shall ape the first nations of Europe in creating monster navies, it is important that it follow not too far behind. The next ten years of the history of the United States will be, beyond much doubt, a record of activity in respect to offensive and defensive preparation.

A Point About Steel.

The causes from which trouble may come with steel are innumerable.

The rapid multiplication of small, portable forges is doing much to increase a certain kind of trouble with it, and in fact this particular cause of trouble with steel has assumed proportions of considerable importance, and by pointing out, as we propose to do, some of the limitations of these small forges, we hope to be able to render a service to steel users, steel makers, and to the makers of the forges as well.

Mechanics understand perfectly well that a hammer must bear some proportion to the size and weight of the piece of steel that is to be forged with it; but it is not so generally understood that this is also true of the fire and the forge in which the steel is heated. Of course, we do not mean to say that a different size of forge should be used for every variation in weight of work; but we do mean to call attention to the fact that a furnace suitable for heating for a steam hammer is unfitted for tempering small drills and taps, and that a small portable forge is utterly unfitted for heating a steel die weighing twenty pounds or more.

Such forges have their uses, to which they are well adapted, but when a large piece of steel, such as a drop or trimming die, is to be heated for hardening, the conditions necessary to the success of the operation cannot be secured with such a forge. It is well settled that when such a piece of work is to be heated there must be a good body of clean fire, and that a considerable bed of the fuel must be below the work, between it and the tuyere openings. Then the character and distribution of the blast must be such as to keep this body of fuel at a nearly even temperature, and while its volume may be large, it must not be fierce and sharp, but mild and gentle.

Just the opposite of these conditions are present with a small portable forge. No large body of fuel can be heated evenly upon it; the blast coming from a few small tuyere openings, closely grouped together, must be sharp in order to get sufficient heat, and the result is an effect similar to that of a blow pipe, with intense surface and local heating, instead of the evenly distributed low heat absolutely essential to success in hardening such work. Then, too often, when the work cracks to pieces in quenching, the steel maker is blamed.

Of course there is little of this particular kind of trouble in the large shops, for in them regular forges are always found, and it is to the owners of the small shops, particularly where "rooms with power" are hired for manufacturing purposes, that this is addressed, in the hope that it may show some one a cause of trouble with steel not previously suspected.

Such small forges as we refer to are excellent for the class of work for which they are intended, and small tools can be hardened with them as well as with any other forge, especially if charcoal is the fuel used; but it should be recognized that they, like most other things, have their limitations. It should be remembered, too, that pure soft water is a good, if not the best quenching liquid, and that water in which more or less washing of hands with soap has been done is not pure water. The water and the tub containing it should be clean.

Some stationary engineers, we are sorry to say, are inclined to look down upon fellow engineers who, in charge of comparatively small plants, do their own firing. Unless we are misinformed, there are associations of engineers that have declared against admitting to membership what they derisively call "shovel engineers." This appears to be an exceedingly shallow proceeding, savoring pretty strongly of the shoddy aristocracy order. There are, in associations of stationary engineers, men who handle their own coal, who are, in every particular relating to the management of a steam plant, equal to those who are so fortunate as not to be obliged to handle the shovel. And there are more engineers who can manage a steam engine well than there are who can use coal economically. The one who can do both is the better engineer.

A correspondent is desirous of knowing, for practical reasons, how the term "monkey wrench" came to be applied to this well-known tool. Tradition has it that "Monkey" or "Monky" was the name of the inventor. If any of our readers have any facts in regard to this, we shall be glad to hear from them.

Another correspondent, who writes that he has been in a kiln-dry when the temperature was 220° F., would like to know the limit of human endurance in that respect.

Literary Notes.

AN EXACT REPRINT OF THE FAMOUS CENTURY OF INVENTIONS of the Marquis of Worcester. (First published in 1663.) With Introduction, Notes, and a Life of the Author. By John Phin. With portrait, after a painting by Vandyke.

The object in reprinting the famous "Century of Inventions," as it is generally called, is not to give any novel solutions of the problems which it sets forth, but simply to place this exceedingly interesting production within the reach of ordinary book buyers. The first edition was published in 1663, and although it has been several times reprinted, it is so scarce that copies are to be had only with considerable difficulty. It is said that this is largely due to the fact that all the copies that were procurable were bought up and burned by a rival inventor (Savary), who claimed to be the first inventor of the steam engine. Great care has been taken to reproduce exactly (so far as modern type, etc., could do it,) the edition published by the marquis himself.

Many persons claim that the Marquis of Worcester anticipated many of our most important modern inventions and discoveries. But by careful perusal of this work, which cannot fail to be interesting to any one, the intelligent student will undoubtedly conclude that many of the alleged inventions described in the "Century" were solved only in the imagination of the marquis. Many of the inventions described have only recently been brought to a degree of perfection of which the marquis could have had no idea. Indeed, it may be said that there has not been brought to light one scrap of writing, or one fragment of a model, that tends to show that the marquis ever developed a successful invention, or that he ever carried one to such a degree of completion as would enable a modern mechanic to profit to any extent by his labors. But by these remarks we do not wish to impugn his veracity; he was undoubtedly honest, a keen student, and an enthusiastic inventor. He was probably gifted with a vivid imagination, like many of our modern inventors, who, after having worked out their ideas on paper, and made crude models, have no hesitation in risking their lives on the result, but are nevertheless doomed to disappointment when the invention is put to a test in actual practice.

The short sketch of the life of the marquis, and the Introduction, is very ably written, and shows much painstaking and research.

The book is published by the Industrial Publication Company, New York. Price, $1.

THE PATENT SYSTEM OF THE UNITED STATES, SO FAR AS IT RELATES TO THE GRANTING OF PATENTS. A History. By Levin H. Campbell, Assistant Examiner in the United States Patent Office, Washington, D. C. Illustrated.

The author has prepared a little work on the subject named above, that cannot fail to interest readers of almost every class. He has done this at, undoubtedly, a good deal of cost in time in making the required researches. Beginning with the early English system as necessary to an understanding of the early practice in this country, he follows with the Colonial and State practice in this country, the power in the constitution to grant patents, and patent law from early times in the history of this country down to the present time. Much new matter is presented, that is, matter that has not before appeared in popular print. The book is well worth the price for which it is sold, viz., fifty cents.

Mr. William Barnet Le Van, of Philadelphia, Pa., has reprinted, in pamphlet form, a paper read by him before the Franklin Institute, and printed in the Journal, on "Riveted Joints in Boiler Shells," There is a good deal of interesting and instructive matter in the pamphlet.

In our illustration, last week, of the engines of the Italian steamship "Sirio," we failed, by an oversight, to state that we were indebted for the drawings and the main points of the description to Mr. Charles de Grave Sells, of Genoa, Italy.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(203) E. R. T., ———, N. Y., writes: Please state where I can get the standard code of railroad signals and train rules in book form; also state price. *A.*—Write to W. F. Allen, secretary of the General Time Convention, 46 Bond street, New York.

(204) J. J. L., Haselton, Ohio, asks: Can gas or air, if supplied in sufficient quantities, be used in place of steam in running any ordinary steam engine? *A.*—Gas or air cannot be used with advantage in an ordinary steam engine. Air or gas motors require a construction different from that of an ordinary engine.

(205) G. F. N., Perth Amboy, N. J., writes: Referring to your answer to Question 60, in your issue of February 5, I think you have made a mistake in your computation. I cannot get as great a pressure as you have made it. Please send me the right answer. *A.*—Instead of 308.13, which is the area given for a piston 22 inches diameter, read 380.13; you will then find the answer to be correct.

(206) W. T., Greenbush, N. Y., writes: I have read with interest your article on "What to Study, and How to Study." I would like to take up the course of study laid down; but unfortunately I am not familiar with the science of numbers. Please point out an arithmetic that one of ordinary intelligence can use for self-instruction. *A.*—There are many excellent arithmetics published, and it seems to us that you can hardly fail to make a good selection. But since, in the article referred to, we have mentioned Prof. Olney's geometry and algebra, it may be well to get the "Elements of Arithmetic" by the same author.

(207) G. H., ———, writes: We have some lead burning to do, *i. e.*, some tanks to make to hold sulphuric acid. Can you or any of your correspondents tell us how to do it? Can it be done with a plumbers' ordinary blow-pipe? Do you know of any work published on this matter? *A.*—We understand that this is done by some form of self-blowing alcohol lamps or heaters. We are not, however, familiar with the details of the process, and think the work must be done by one who has had experience in that line. Perhaps some of our readers can give full information. There is no book on the subject, so far as we are aware.

(208) W. E. H., ———, asks: Will you please inform me how to harden dies, such as are used in stocks for cutting bolts, etc., so that the outside or rim will be soft? *A.*—The method adopted for this would have to depend upon the proportions of the dies, somewhat. One way would be to arrange for passing a stream of water through the die by holding it in clamps having holes through them for the water to pass through. Another way would be to cover the portion that is to be left soft with a cap of heavy sheet metal in such a way that the water will not come into contact with it when hardening. Another way is to draw the temper by placing the die within a ring of heated iron, this ring being heated so hot as to draw the temper nearly all out of the outer portions of the die before the heat reaches the inner part. The particular method adopted must, as we said above, depend on the proportions of the die. 2. Please also tell me how to cut a gear on the universal milling machine, which is not given in the table? *A.*—You will find articles on this subject in the issues of October 31 and Dec. 12, 1889; Jan. 23, May 22, July 10, Aug. 14 and Oct. 16, 1890.

(209) S. V., Boston, Mass., writes: There is a difference of opinion in the shop in regard to turning a taper. I maintain that the tool should be on the center every time a fresh cut is made, otherwise the same taper will not be preserved. Would you kindly show some simple drawings illustrating the errors with tools, say, $\frac{1}{4}$ inch or $\frac{1}{2}$ inch above the centers, and give as many views as possible? *A.*—We can give these drawings, but we think there is a better way of making the matter plain to those who cannot reason it out. Take a piece of wood and center it in the usual way for the lathe. Set the lathe to turn the greatest taper possible, and put in a tool which can be made to cut at or near the top of the piece of wood. Arrange, if possible, so that the tool will pass over the center of the piece at about the center of its length. The sides of the piece will then be double curves, and the reason for it will be readily seen. When the cutting point of a lathe tool moves in a line parallel with the line of centers a cylinder is produced. When it moves in a line which is not parallel with the center line, but intersects it at some point, a cone or taper with straight sides is produced. When it moves in a line which is neither parallel with the center line nor intersects it at any point, neither of these forms is produced, but the work will have a curved outline. You will find drawings illustrating this matter in our issues of Feb. 4, April 8, and May 6, 1882, which may be obtained through any news dealer. But we advise trying the experiment described above, which will show in an exaggerated form just what occurs when a taper is attempted to be turned with the tool elsewhere than level with the center.

(210) J. F., ———, writes: I wish to run a saw 2,400 revolutions a minute, and my main shaft runs 90 a minute. Pulley on saw arbor is 5 inches diameter. I wish to know an easy way to find the diameter of pulleys for line and countershaft. *A.*—Dividing 2,400 by 90, we find that the ratio of speed between the saw arbor and line shaft is 26.6. It is best to increase the speed in nearly the same ratio from lineshaft to countershaft, and from countershaft to arbor, and to find the ratio for each we take the square root of 26.6, which is 5.157. Multiplying 5 inches (the diameter of pulley on arbor) by 5.157, we get 25.867 inches for the larger pulley on the countershaft, and we may make this even 26 inches. Now, if we chose 8 inches for the diameter of the smaller pulley on countershaft, we multiply this by the same number, 5.157, and we get 41.256 inches for the diameter of pulley on the line shaft, and we may make this even 41 inches. If two countershafts were to be used, thus making three steps in increasing the speed, we should have taken the cube root of 26.6 for the ratio of the pulleys for each step. It is not always practicable or desirable, however, to have a uniform ratio of increase of speed, and where this is the case, the sizes of the pulleys are usually determined by trial computations, which are made by multiplying the speed of the line shaft by the continued product of all the proposed drivers, and the speed of the arbor by the continued product of all the proposed driven pulleys. If the two products are equal or nearly so, the pulleys are right; if not, then one or more pulleys must be changed until the two products are nearly equal, remembering that the greatest proportionate increase of speed can usually be obtained by long, horizontal and crossed belts.

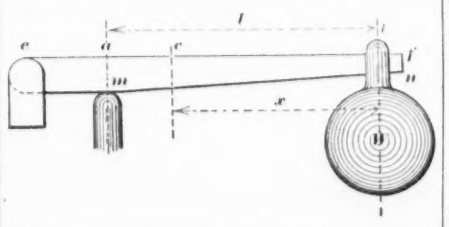
(211) J. J. A., Ironton, Ohio, writes: Please give me a formula for computing the correct proportions of levers for safety valves; and also for finding the bending moment of the same. *A.*—Let a be the center line of the valve spindle; l the distance in inches from a to the center line b, drawn vertically through the center of the weight W; and let W denote the number of pounds of the weight. The dangerous section of a safety valve lever is at $a\ m$; now neglecting the weight of the lever, the bending moment for the section $a\ m$ is $W \times l$. For static equilibrium, this bending moment is equal to the resisting moment; the latter is, for all rectangular beams whose sides are vertical, equal to $\frac{1}{6}\ R\ b\ d^2$, in which R is the stress in the upper and lower sides of the lever or beam. It is customary, in practice, to use a fractional part of R, called the factor of safety, when beams are to be proportioned. About $\frac{1}{6}$ to $\frac{1}{4}$ of R is used for wrought-iron, which gives for the safe valve of R per square inch about 10,000 to 12,000 pounds for wrought iron; b denotes the breadth; and d, the depth of the lever all in inches. Hence, from the foregoing we have

$$W \times l = \tfrac{1}{4} \times R \times b \times d^2 \qquad (1)$$

If we adopt 12,000 for the value of R, we have

$$W \times l = 2{,}000 \times b \times d^2 \qquad (2)$$

There is no established rule for finding the ratio between the breadth and depth, hence one of these dimensions must be established



arbitrarily. Probably a good rule is to make the depth equal to $\frac{1}{20}$ of the length l. Now with the depth established, we can find the breadth by the following formula:

$$b = \frac{W \times l}{2{,}000 \times d^2} \qquad (3)$$

To show the application of formula 3, let us take the following example: The length l of the lever (see sketch) is 40 inches; the weight W is equal to 100 pounds; what should be the proportions of the lever? If we make the depth at a equal to $\frac{1}{20}$ of l, then d will be equal to 2 inches. Now substituting for the symbols in formula 3 their values, we have

$$b = \frac{100 \times 40}{2{,}000 \times 2 \times 2} = 0.5 \text{ inch.}$$

Hence the dangerous section $a\ m$ is 2 inches deep and $\frac{1}{2}$ inch wide. If now the breadth is kept constant, we can, in a way similar to the foregoing, find the depth of the lever at any other section. For instance, let it be required to find the depth for a section at c, at a distance of x from the center of the weight. We first find the bending moment for that section; it is equal to $W \times x$. Since the bending moment is equal to the resisting moment, we have

$$W \times x = 2{,}000 \times b \times d^2,$$

from which we get

$$d = \sqrt{\frac{W \times x}{2{,}000 \times b}},$$

if $x = 20$ inches, all the other data remaining the same as before, we have

$$d = \sqrt{\frac{100 \times 20}{2{,}000 \times .5}} = \sqrt{2} = 1.41 \text{ inch.}$$

If we make the upper edge $a\ f$ straight, then for uniform strength and uniform breadth the lower edge will be a parabola instead of a straight line $m\ n$. A lever whose lower edges are curved will be too expensive to make, consequently the parabola is replaced by its tangent, or, in other words, the lower edges are made straight, tangent to the parabola at a, which makes the depth $f\ n$ at the end of the lever equal to one-half of the depth $a\ m$ of the dangerous section. Consequently for safety valve levers we first find the depth and breadth of the dangerous section, as we have explained, and then keeping the breadth constant, we make the depth at the end of the lever equal to one-half of the depth of the dangerous section, and all the edges are made straight. Many safety valve levers are made of the same depth and breadth throughout; the extra metal is not wasted since an equivalent amount can be deducted from the weight W. If, in this case, the weight of the lever is taken in account, the bending moment for the dang rous section is

$$(W \times l) + \left(\frac{Q \times l}{2}\right).$$

In which Q denotes the weight of the lever from the section $a\ m$ to the end $f\ n$. Since the bending moment must be equal to the resisting moment, we have

$$(W \times l) + \left(\frac{Q \times l}{2}\right) = 2{,}000 \times b \times d^2,$$

from which b or d can be easily computed. The bending moment for a tapered lever, when its weight is taken into account, is

$$(W \times l) + (Q \times i),$$

in which i is the distance from the dangerous section to the center of gravity of that portion of the lever, which extends from the section $a\ m$ to the end $f\ n$. The form of the lever from a to e will depend on the design of the safety valve.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Geo. B. Grant's new book is advertised on page 20.

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For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

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"Twenty Years With the Indicator," by Thos. Pray, Jr., 10,100 sold. Price $2.50. Order of bookseller; take no other.

N. Y. City Bolt & Nut Co., Limited, 33 and 35 Desbrosses St., N. Y. City, manufacturers of Machine Bolts of every description. Write for estimates.

25" 32" 37" 42" "Only Drill Press built on 'Ko-rekt' principles, even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

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Foot and Power Presses for Metal, Paper and Leather; perforating dies a specialty; estimates given for special Machines or Dies. Edwin B. Stimpson & Son, Manufacturers, 31 Spruce St., New York.

Every draftsman needs one. The Engineer's Sketch Book of mechanical movements, appliances, devices, contrivances, etc., by T. W. Barber. 1,936 illustrations, 8vo. cloth, $3. Catalogue of books on mech. subjects free. E. & F. N. Spon, 12 Cortlandt St., New York

Hawkins' Hand Book of Calculations for Engineers, Firemen and Machinists, is a work of instruction and reference. 10 parts, 25 cents each; (bound, $2.50). Send 25c. for Part I. and sub. blank for the series. Theo. Audel & Co., Pubs., 91 Liberty St., New York. Catalogue free.

De Lamater Screw Propeller Wheel made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

Club Rates.—If no one is getting up a club for the AMERICAN MACHINIST in your town or establishment, send for Circular of New Club Rates, and try it yourself. Address AMERICAN MACHINIST, 96 Fulton St., New York.

"Binders" for the American Machinist. Two styles, the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price $2, postpaid. Published by John Wiley & Sons, 53 East 10th St., New York.

MANUFACTURES.

C. F. Pekor is reported as to erect a machine shop at Columbus, Ga.

Another cotton-mill will probably be erected at or near Chester, S. C.

E. H. Mason, of Atlanta, Ga., will establish a machine shop in Madison, Ga.

The machine shop of P. C. Close (Augusta, Ga., will be enlarged and rebuilt.

It is stated that J. Alston will at once erect a machine shop in Greenwood, S. C.

A proposition has been made for the erection of a $12,000 ice factory, at Marlin, Texas.

A stock company will probably be organized to erect a cotton-mill at High Point, N. C.

An English company is to establish a mill at Shelby, Ohio, to make tubes for bicycles.

It is proposed to organize a $25,000 stock company to erect a cotton-mill at Carmichael, S. C.

At Oxanna (Ala.) plans are afoot for establishing a bolt factory, and also steel spring works.

It is reported that the Fort Payne (Ala.) Coal and Iron Company will erect an electric light plant.

It is proposed to organize a $25,000 stock company to erect a cotton-mill at Carmichael, S. C.

A stock company has been organized to establish a foundry and machine shops at West Point, Md.

The Bates Steel and Iron Company, capitalized at $100,000, have been incorporated at Columbus, O.

The Demorest Machine Works has erected buildings and started machine works, at Demorest, Ga.

It is stated that a rolling-mill is to be erected in Baltimore, Md., by C. D. Beckwith, of Paterson, N. J.

The Elison Machine Works, of Montgomery County, have been incorporated at Richmond, Va.

C. F. Kane, of Martin's Ferry, Ohio, has established a branch machine shop in Mannington, W. Va.

W. J. Johnson, of Oskaloosa, Iowa, will establish a foundry and machine shops at Grand Junction Col.

F. H. Poor, Haverhill, Mass., will build a machine shop and foundry for the manufacture of steam pumps.

The Imperial Cotton-mills Company, Florence, Ala., recently incorporated, will erect a cotton-mill at once.

The Michigan Rolled Steel Wheel Company, of Detroit, Mich., has been incorporated, with a capital of $50,000.

The Fairbank Zinc Company, of St. Louis, Mo., has filed articles of incorporation. The capital stock is $20,000.

A cotton-mill, to be known as the Fingerville Cotton-mill, is reported as in course of erection at Fingerville, S. C.

A $25,000 stock company will, it is stated, be organized at Macon, Ga., to erect an agricultural implement factory.

H A. Johnson & Co., Chattanooga, Tenn., will put in new machinery and enlarge their saw-mill, at a cost of $15,000.

Iron works and machine shops are to be erected at Florence, S. C., by the recently incorporated Florence Iron Works.

The Howard-Harrison Iron Company, at Bessemer, Ala., commenced work on the 18th ult. They will employ 1,000 men.

Mr. Tipton, of the Dalton Development Co., is organizing a company in the Eastern States to erect car works at Dalton, Ga.

According to report, the Harrisonburg Land and Improvement Company, of Harrisonburg, Va., have secured a large steel plant.

The Kelly Axe Manufacturing Company, of Louisville, Ky., contemplate the improvement and enargement of their axe works.

The organization of a stock company to erect another cotton-mill on the co-operative plan is projected at Lexington, N. C.

There is a report that the Amherst Development Company has secured a cotton factory to be located on its land at Amherst, Va.

A rolling-mill for the tack association may be located at East Taunton, Mass. It is understood that negotiations to that end are now being made.

The South Pittsburgh Electric Light and Power Company is reported as to increase the capacity of its electric light plant at South Pittsburgh, Tenn.

A foundry and pipe factory is to be established at New Birmingham, Texas, at a cost of $100,000. Active work on the plant will begin at an early date

The St. Louis (Mo.) Steel Foundry Company will rebuild their works at East St. Louis, recently burned, as soon as the matter of insurance is adjusted.

Lee & Hoff are erecting a new plant at St. Paul, Minn., for the manufacture of boiler tube expanders, which will be double the capacity of the old plant.

Skinner & Scott, wheel manufacturers at Lynn, Mass., are building a new factory, 131x60 feet, four stories. It will be equipped with all the latest machinery.

A brass foundry is to be erected by Nixon & West at Chattanooga, Tenn., to manufacture builders' hardware, journals, etc. The cost of the foundry will be $30,000.

The Champion Warehouse and Compress Company, Wilmington, N. C., has increased its capital from $100,000 to $500,000, and will erect a jute-bagging factory.

A Cleveland concern making a new style of steel car, and giving employment to 1,000 men, is negotiating for the Whiteley Reaper Works, on East street, Cleveland.

At Fort Payne, Ala., it is understood that $75,000 will be expended in improving and putting in operation the hardware factory of the Alabama Builders' Hardware Company.

The O. L. Packard Machine Company, of Milwaukee, Wis., has filed articles of incorporation signed by W. S. Williams, Fred. H. Kappe, Fred. Hildebrand and James Morrison.

A Mississippi party is in correspondence with the Board of Trade relative to the organization of a stock company for the purpose of erecting a $40,000 cotton-mill in Shreveport, La.

The Uvalde Ice, Gin and Milling Company, recently organized at Uvalde, Texas, to erect an ice factory, cotton gin and press and grist mill, has been incorporated, with a capital stock of $20,000.

The United States Iron and Steel Plate Works, at Demmler, Pa., are running to their full capacity, and the company are arranging for several additions to be made at the plant this summer.

It is stated that subscriptions to the amount of $50,000 have been made by Pineville (Ky.) parties, with a view to inducing a Pittsburgh firm to remove its 70-ton furnace to the former place.

J. W. Bryan, J. O'Hara and S. D. Rouse have incorporated the Turner-Beard Brake Company, at Covington, Ky., to manufacture brakes for locomotives, cars, wagons, etc. The capital stock is $10,000,000.

The new plant of the Boston Iron and Steel Company, in course of erection at McKeesport, Pa., is rapidly nearing completion. The furnaces are about completed, and part of the machinery is on the ground.

The Salisbury Cotton-mills Company, Salisbury, N. C., has decided to build the new cotton-mill, and will issue $75,000 additional stock for the purpose. Main building will be 300x125 feet, and will contain 75,000 spindles.

The Steinhilber Combination Car Company, of Chicago, Ill., has been incorporated, to manufacture and sell stock, freight and coal-chute cars. Capital stock, $500,000. Incorporators, Wm. Fuller, M. B. Mills and A. B. Fuller.

Work will soon be commenced on the rolling-mill at Salem, Va., which has been moved to that place from Newport, Ky. The new organization will be known as the Salem Rolling-mills Company. The capital stock is $100,000.

The Turner-Beard Car Brake Company (Covington, Ky.,) capital, $10,000,000, has received a charter. James W. Bryan, J. O'Hara, and others, incorporators. A patented brake for cars and locomotives will be manufactured.

The directors of the Midway Company held a recent meeting at Roanoke, Va., and decided to put the iron works into immediate operation. Work upon the machinery will begin at once, and in a few days the mill will be turning out spikes, etc.

The Steele Signal Company, of Chicago, Ill., has been incorporated, to manufacture and deal in all kinds of railway appliances and devices; capital stock, $1,000,000. The incorporators are Charles Higgins, Harry W. Powers and Robert E. Davidson.

H. D. Emerson, T. J. Creaghead, C. L. McCrea and others have incorporated the Creaghead Engineering Company, at Covington, Ky., to manufacture all kinds of electric, mechanical and manufacturing appliances. The capital stock is $25,000.

The Lone Star Iron Company, of Jefferson, Texas wish to amend their charter, increase their capital stock, and provide for the issuance of bonds for the erection of a steel plant. A special meeting will be held at their office in Chicago, Ill., on May 4.

The Davis Gun Company, located in Assonet, Mass., is agitating the question of an extension of business, and an addition will probably either be built to the present shop, or a branch factory started in some town in the southeastern part of the State.

The Gardner Steam Pump Company has been incorporated, at Quincy, Ill., with a capital stock of $50,000, to manufacture steam pumps. The incorporators are Robert W. Gardner, D. C. Neustat and J. W. Gardner. Buildings are now being erected.

The Penberthy Injector Co., Detroit, Mich. (New York office, Donegan & Swift, 11 Murray street,) manufacturers of the Penberthy automatic (restarting) injector, inform us that since starting business 42,000 of these injectors have been placed on the market.

There is water-works agitation in Braintree, Mass.; Dartmouth, N. S.; Richlands, Va.; Avoca, Iowa; Middletown, N. Y.; Cincinnati, O.; Union, Oregon; Uniontown, Ala.; Lonaconing, Md.; Riverdale, Ill.; Waitsburg, Wash.; Canton, O.; Fairmont, W. Va.

The Albion Iron Works Company, of Victoria, B. C., will erect and equip suitable shops at Esquimault, B. C., in the immediate vicinity of the dry dock there, the better to enable them to carry on that branch of their business calling for repairs to vessels in the dock.

It is intended to utilize the old Mason Machine Works and boiler shop, at Taunton, Mass., for the manufacture of the new American carding machine. Necessary machinery is to be put in at once, and in the near future it is expected that an extension of the works will be made.

The Norfolk (Va.) Supply Company, with a capital stock of $50,000, has been incorporated by B. D. Groner, president; T. E. Elliott, vice-president, and F. J. Bain, secretary, for the purpose of establishing machine shops for the manufacture of railroad, steamboat and other supplies.

The stock company recently organized by J. W. Womeldorf, of Cincinnati, Ohio, as president, to remove a Newport (Ky.) rolling-mill to Salem, Va., will be known as the Salem Rolling-mills Company, with a capital stock of $100,000. It is stated that work will soon be commenced.

The Martinsburg (W. Va.) Mining, Manufacturing and Improvement Company has accepted the proposition from eastern capitalists to erect a tube works in that city. This plant will be known as the Martinsburg Tube Works, and will give employment to about one hundred hands.

A contract has closed by the Basic City (Va.) Company, whereby the Cochrane Roller-mill Company, of Escanaba, Mich., will remove its plant to the former city. General machinery and castings, chilled grain rolls, chilled iron and castings of all kinds comprise the work which will be done.

Bridgeport (Conn.) people are offering the Page Typesetting Machine Company a lot of land, and a building, free of rent and taxes for ten years, if they will remove the concern from Hartford to that city. Mr. Page thinks the company will, after the machine is in the market, employ 5,000 workmen.

The Schultz Bridge and Iron Works has been incorporated by Pittsburgh parties. The plant will be located at Chartiers Station, Pa., and all kinds of bridge and structural iron work will be produced. H. W. Oliver is president. The directors are T. S. Bigelow, A. R. Schultz, D. D. Oliver and T. W. Herzogg.

Swift's Iron and Steel Works, located at Newport, Ky., and lately purchased by the Cincinnati Corrugated Iron and Steel Company, will commence operations some time in May. It is said that Mr. L. F. Hubbard, of Covington, will be the superintendent. The new company will employ several hundred hands.

The firm of Harley & Diebel, machine manufacturers, Howard and Huntingdon streets, Philadelphia, has changed hands. Mr. Diebel has bought his partner's interest, and will remove the works to larger quarters at Third and Cumberland streets, where he will put in new tools and largely increase equipment and facilities.

B. M. Jones & Co., 11 and 13 Oliver street, Boston, sole representatives, in the United States, of Samuel Osborn & Co., Sheffield, England (manufacturers of "Mushet" steels), have opened a branch office at 143 Liberty street, New York. They are also agents for the "Taylor" Yorkshire iron for staybolts, piston rods, etc., etc.

The John,F. Byers Machine Company, of Ravenna, Ohio, recently organized with E. R. Crowell, president; Marvin Collins, secretary and treasurer, and J. F. Byers, superintendent, has just finished the construction of its brick machine shop, 28x120 feet. It is the company's intention to add a large foundry building the coming summer.

The Reeves Iron Company, of Canal Dover, O., are making some very extensive additions to their plant. They have under construction a building 258 feet long and 65 feet wide at one end, and 180 feet at the other, for the manufacture of sheet-iron and galvanized iron. The building and plant, when completed, will cost not less than $100,000.

The Pullman Palace Car Company has closed negotiations for an extensive new manufacturing site, at St. Louis, Mo. This purchase covers an area about four times greater than that formerly occupied by them. The price paid aggregated $137,000. It is stated that fully 1,000 men will be employed in the new plant, which will soon be commenced and pushed to completion without delay.

L. Schutte & Co., of Philadelphia, manufacturers of injectors and jet machinery, are soon to begin the erection of a new six-story factory and machine shop, 85 feet square, on the site of their present building at 12th and Thompson streets. The old building will be occupied just as usual, while the new building goes up around it. The new place will afford largely increased facilities.

The Laughlin Manufacturing Company, of Louisville, Ky., have closed a contract with the Harvey Land Association, of Harvey, Ill., a suburb of Chicago, for 485x200 feet of property, fronting south on 151st street, to be utilized as a factory site. The Laughlin Manufacturing Company, of which S. E. Bliss is manager, will employ about 150 men at their works, in the manufacture of shafting and pulleys.

D. Saunders' Sons, Yonkers, N. Y., have issued a new 1891 catalogue entirely devoted to machines and tools for pipe-cutting and threading operated by hand. This catalogue is distinct from their catalogue of power machines, although some of the machines shown are arranged for the application of power, if desirable. A variety of machines, appliances and small tools for pipe work are illustrated and described, and prices given.

The Philadelphia Shafting Works, Geo. V. Cresson, Philadelphia, Pa., issue a catalogue illustrating and describing power-transmitting machinery made at the works, embracing shafting and all appurtenances. Mr. Cresson has made a study of transmitting power from one story to another by means of vertical shafts, upon which he has improvements, and he believes such means of transmission to be superior to the use of belts.

The States Machine Co., Newark, N. J., manufacturers of the "Universal boring and milling engine," and other mechanical specialties, having outgrown their former shop, have removed to temporary quarters in Newark, on Mulberry street, near the Centre street station of the P. R. R., pending their final removal some months hence to Hartford, Conn., where they will occupy a shop 200x45 feet, affording largely increased manufacturing facilities.

Negotiations leading to the lease of the plant of the Trinidad Rolling-mills and Iron Company, at Trinidad, Col., have been completed, and the plant has been leased to Ralph J. Wick, of Youngstown, Ohio, for one year, with the privilege of purchasing it at the end of the year for $26,900. It is understood that Mr. Wick, who is now in Trinidad, will improve the plant to the extent of $6,000 or $8,000, and that the mill will be in operation in a short time. It was built in 1888-89, and is said to have originally cost $65,000.

A new stove foundry will be built at Bangor, Me., the firm of Albert Noyes & Co. having united with the stove department of the Bangor Iron and Machine Company in the establishment of this industry. A stock company will be formed to handle the business, the stock being largely controlled by these two concerns. At the foundry will be manufactured all kinds of stoves, sinks and hollow ware, and it is proposed at first to employ a force of some forty or fifty men. There will be no delay in building, and stoves will probably be made at the new foundry this summer.

T. F. Morrin is building at the Glonbrock Steam Boiler Works, Brooklyn, N. Y., three "Climax" boilers, the largest of that type he has yet built. Each boiler will be 37 feet in height, and the total diameter will be 15 feet. The inside shell is 56 inches diameter, and each boiler will have 864 three-inch tubes, 12 feet in length, making a total length of nearly two miles of tubes. The heating surface of a boiler is 8,000 feet, grate surface, 138 feet, and it is guaranteed to evaporate 24,000 pounds of water per hour. The metal alone of one boiler will weigh 103,000 pounds. The weight of water will be 48,500, and total weight of each boiler in running condition, 180,500 pounds. These boilers, and eventually several others, will be located on the upper floor of the building. They will discharge the gases into a stack 15 feet diameter, and 176 feet high. The stack will be of iron or steel, the lower courses one inch, and the upper courses one half inch thick. At and towards the bottom, the stack will be lined up to a diameter of 13 feet.

Detroit Shop Notes.

(*Continued from page 7.*)

which was new to me, and which Mr. Leland said was an idea that they picked up in Detroit.

The worms for these wheels are of cast-iron, and are 8½" diameter, with four threads to the inch, the worms being much larger in proportion to the size of the worm wheels than is usually the case. The wheels were first notched in the milling machine as usual, and were then finished by hobbing, but instead of making the hob in the usual way, of steel, which, in this instance, would have been quite an expensive method, it was made of cast-iron, and in one of the threads was inserted a cutter, which was of the proper shape, and projected very slightly above the threads of the worm. This was used for hobbing in the usual way and was doing the job very nicely and at much less expense than the hob would have cost made in the ordinary way.

THE GRAHAM TWIST DRILL CO.

This is another of Detroit's new enterprises—at least the company has only recently become much known to the general public, though they have been working for some time in an experimental way, perfecting the methods of manufacture and the drills, which they have now placed on the market.

The drill, which is a Canadian invention, was illustrated with a chuck for holding it in our issue of March 5, and it will be remembered as a drill which is the same as the regular thing so far as the body is concerned, being straight lip, increase twist, etc., but when it comes to the shank, and the method of holding and driving it, there is a radical difference, the shank being parallel, and with V grooves, which may be called a continuation of the regular grooves of the drill straight up at each side of the shank.

METHODS OF MANUFACTURE.

The methods adopted for manufacturing these drills differ entirely from those usually followed, though most of the operations performed have been preceded by others elsewhere that are somewhat similar to them. Only the grooves in the shank are milled, the spiral grooves in the body of the drill being formed by rolling while hot and afterwards finished by grinding.

ROLLING GROOVES.

The stock is received in square bars, which are first heated and run through rolls, which simply form two straight grooves in the bar, one at each side, these grooves approximating the form of the finished groove in the shank and body of the drill. The bar is then passed through rolls which are of the proper form for the groove in the body and are eccentric, the circumference of that part of them which does the actual rolling being equal to the length of the body of the drill before it is twisted. The eccentricity of the rolls is just sufficient to give the increased thickness at the center as the shank is approached, and there is a blank place which equals the length of the shank, so that as the bar passes through the grooves for each drill are finished ready for twisting.

TWISTING.

Before this is done, however, they are cut from the bar by hot sawing, and after being reheated are twisted by a machine in which one end of the drill is held, while two opposite rollers are applied to the grooves, and these rollers are so mounted in a head that as they are drawn off they turn about the axis of the drill and produce the twist. The rolls are not given an accelerated motion to produce the increase twist, as would naturally be supposed, but that is accomplished by giving a portion of the drill an initial twist before the machine is put in motion, and by the management of the heat. The grooves are then ground "free hand" sufficiently to give them finish.

MILLING GROOVES.

The grooves in the shanks are milled in special machines, one of these that I particularly noticed having three upright spindles, with chucks for holding the drills, and two

milling arbors to each of these, so that the grooves in each side of a shank were milled simultaneously. As the thickness of the shank is not very great at the center, the cutters for doing this have to run quite close together, and on account of convenience of operating, the arbors are placed side by side and parallel to each other. This necessitated a peculiar form of driving gear, which would work in a very small space, and yet be sufficiently powerful, and the plan was adopted of using on each spindle what may be called a half worm wheel, *i. e.*, the wheels are made as though an ordinary wheel with rounded face were, before being hobbed, cut in two while on the lathe arbor, and one side of it cut right-hand, the other left. One of these is placed on each of a pair of driving arbors in the machine, and they can overlap or pass by each other, thus allowing the spindles to be brought quite close together. They are driven by worms, one right and the other left-handed, a single worm shaft which runs along the side of the machine driving the six worms for all the spindles.

I understood that this machine had been designed by the inventor of the drill, and had been used by him in an attempt which he had formerly made to reduce the manufacture of the drills to a practical basis. It embodies a good many ingenious points, and does very good work, though it is plain that it does not contain enough metal to make it efficient according to the modern meaning of the term as applied to milling operations. The same criticism will, indeed, apply to most of the machinery which came from that source, but this fact has been fully recognized by the present owners, and as fast as possible new machinery is being designed and built for the rolling, twisting and milling, some of it being already completed. The reports which have come in from the users of the drills give abundance of encouragement for the necessary outlay for this, and under the guidance of Mr. Barlow, as superintendent, it is safe to say that the highest efficiency will eventually be attained in all respects.

HEATING AND TEMPERING.

All heating for rolling and tempering is done in furnaces using crude petroleum as fuel, by which a very even and controllable heat is obtained, with very satisfactory results. A lead bath is used for hardening, which is kept at a uniform temperature by the oil; and for drawing, a furnace is used which resembles the rotary ovens used in modern cracker bakeries. There is a wheel revolving in a vertical plane, and carrying at its periphery a number of shelves, or pans, on which the drills are placed, these pans being suspended in such a way that they are always level as the wheel revolves. Over the wheel is a metallic case, and below, the heat is applied. The heat is very moderate, and the wheel being kept in motion, the drills are drawn very evenly, and there are peepholes, covered with glass, by which the color may be observed.

GRINDING TO SIZE.

The drills are ground to standard size in Brown & Sharpe machines, the shanks being held in a chuck which grips them just as the regular drill chuck does, and the point runs in a female center. An automatic device is applied to the machine, by which the wheel is fed up towards the work at the beginning of each run over it, and this feed is automatically disengaged at the proper point for the given diameter, this point having been previously fixed by trial with a standard gauge.

SOMETHING SEEN IN A STOVE FOUNDRY.

In Detroit is a stove foun lry that is remarkable in some particulars. To begin with, it is the largest concern in the world devoted exclusively to the production of stoves. It is called the Michigan Stove Works. About 1,300 men are employed, and 70 tons of iron are daily melted and made into stove plates, the works making it a practice to so arrange their business that the amount of work done per day is pretty nearly uniform throughout the year. The foundry floor is equivalent to a floor 640 feet square. About 250 different styles of stoves are made, the leading ones being the well-known "Garland" heating and cook stoves.

TESTS OF IRONS.

I confess to a very limited knowledge of stove making or of stove plate molding, and I should not have thought of going to a stove foundry, even one so remarkable in many ways as this one, with the expectation of finding anything of interest to machinists or machinery molders, had I not known that this works is superintended by a man of world-wide reputation among metallurgists, especially in connection with his system of testing irons, which have become known as Keep's tests. Those whose work has been in connection with machinery would hardly think of looking for anything in this line in a stove foundry that they would expect to be very startling, but the fact is, that Mr. J. W. Keep, who superintends this foundry, is an educated and trained engineer, who applies to the stove business his general knowledge of engineering. Originally a machinist, he afterwards took up civil engineering, and for a time made a special study of steam engineering. At Troy, N. Y., he first became connected with the stove business, going from there to his present position.

His methods of testing iron I will not attempt to enter into a detailed description of at this time, but will do what will, I hope, be much better for our readers, *i. e.*, try to get him to describe them himself, with special reference to their use in machinery and general molding, and I hope he will do this before long. For the present it may be said that the underlying principle of the tests is that they are wholly comparative or relative. They are strictly confined to bars of one size, viz., $\frac{1}{2}$" square and 12" long. These bars are tested in two different ways—by impact, and by a steadily applied load, the machines being so arranged that each of them automatically makes a graphic record of the behavior of the test bar — its deflection, permanent set, and the stress which finally breaks it. This is accomplished by surprisingly simple machines, but in which there has been great ingenuity displayed. They have added considerably to the general stock of knowledge concerning irons, and may be expected to add more, and to help in diffusing that knowledge among the men who can make the best practical use of it.

A NEW METHOD OF MAKING PATTERNS.

A very peculiar system of making patterns for stove plate work has been introduced here by Mr. Keep, which is worthy of notice on account of its ingenuity and the results accomplished by it.

The old method of making stove plate patterns, and the one which is still followed in such foundries almost universally, is to make the first pattern of wood, the outside being first carved into shape, and then the back or inside carved to correspond, so that the pattern shall be uniformly of the specified thickness—usually $\frac{1}{16}$". Where the pattern is highly ornamental and intricate, as most stove plate patterns are nowadays, the reverse side is much the most expensive to make, because its thickness must be constantly gauged as the work goes on, this gauging being anything but easy, especially where the pattern, besides being intricate, is of large size. This wood pattern is used but once, usually, the casting made from it being finished up for regular use in making stove plates.

By the improved method the form of the outside of the pattern only is carved on a block of wood, and this is then covered by a preparation of wax, which is put on soft in a number of coats of uniform thickness. It then hardens, and is removed from the carving, one side (that which was next the carving) being then exactly the right shape for the inside of the pattern, while the other is right for the outside, and it is of precisely uniform thickness. It is stiff enough to retain its shape well, and is, when thoroughly hardened, covered all over with a thick plating of copper, deposited by an electroplating process, which is analogous to that of electrotyping, if not precisely the same. This copper is also of precisely uniform thickness, of course, and the result is a pattern which is in every way much superior to a wooden one, because the copper easily takes a high finish which is conducive to exceptionally smooth castings for the regular foundry patterns, and which require much less labor to finish than is the case where they are made from wood patterns. The copper pattern is unaffected by dampness, and is much more liable to be the same as when first made, in case it should be required for use a long time after being made. The pattern is much stiffer than would be expected, as I found by a test in my hands, which I was invited to make after expressing some doubt on this point. It was evidently much stiffer than a wooden one would have been, of the same thickness. I do not know that the process would be applicable to any other kind of work, and think that it is covered by patents anyhow, but at any rate it was a matter of considerable interest to me, and I suppose will be to most mechanics.

DRY DOCK SHIPBUILDING CO.

The marine engine and shipbuilding establishments of the city are at present experiencing a season of unusual dullness, there being very little going on in this line just now. I had time to visit but one place of this kind, that of the Dry Dock Shipbuilding Co. and the Dry Dock Engine Co., establishments which are side by side, and, though separate companies, are, I understand, under the same ownership and management. Here were built some of the most noted vessels which are navigating the great lakes, among which are the "Hudson" and the "Harlem," that were built for the N. Y. C. & H. R. R. R., and the "Marigold," a vessel which was recently completed for the United States Lighthouse Board. There is little that I noticed that is especially noteworthy there, but they seem well equipped for the work they do, and to be doing a grade of work that will compare very favorably with any done elsewhere. The machine shop is simply what Chordal would call the "Simon pure machine shop," in which good mechanics are employed, and, with the ordinary facilities such as are found in every good machine shop, are depended upon to turn out good work. This is the only machine shop I ever saw where no emery cloth or paper was allowed. The foreman, Mr. John Donaldson, said that when he first came there he thought that was rather a queer regulation; but it seems that there had been some trouble from emery getting into some important bearings of an engine which had to be bored out to get rid of it, and the result was that emery was prohibited entirely. I saw a man finishing connecting rods with flint paper, and he was doing a very creditable job, too. I noticed that one end of these rods was fitted with the ordinary strap and key, while the other, the crank end, had the English, or what is sometimes called the "marine" type of stub end. This was explained to me by Mr. Donaldson by saying that they believed the ordinary strap and key was best for all sizes below 10", and that the other was best for sizes above that, and their practice was in accordance with this belief. Though he himself is a Scotchman, he criticised the practice on the other side of sticking too closely to one type, as though that must necessarily be best for all sizes and all conditions; and he declared that the tendency would be to use the bolted form of stub end all through a vessel from the smallest rod on a donkey pump to the main rods of the main engines, which he did not think was right nor that consistency required it. F. J. M.

At a recent meeting of the Edinburgh Royal Society, Dr. Haycraft described a method for the determination of the density of a liquid, when only small quantities of it can be obtained. A drop of the liquid is placed in another liquid of greater density than it, and a liquid of less density is added until the drop will neither float to the surface nor fall to the bottom of the mixture.

Engineering Notes.

The following is an extract from a letter from W. E. Crane, not intended for publication:

"We have a Knowles independent condenser. This condenser is below the sewer, and so we had to arrange to raise the water —not only the water of the hot well, but the condensed water from the steam cylinder as well. To do this I put a check valve next the drip cock, so that the steam would drive all the water out, and as the drip pipe was quite long, no water could get back into the cylinder, even if it was not all driven out of the pipe.

"I found, also, that it had accomplished another thing: the drips could remain open indefinitely and not impair the vacuum, as no air could get back.

"It is only a short step to another arrangement: put the same thing on the water end of a pump so that the air will all be driven out, but none get back when first lifting water. I am putting such an arrangement on a duplex pump that has given considerable trouble in getting water. Will have that ready to try next week. I think that this last has been tried before, but I have never seen it.

"While using a condenser for the engine the exhaust from the condenser will go into a heater, together with that of all other pumps, to heat the feed water. The duplex pump I mentioned operates hydraulic elevators and cranes. I do not know that this has any special feature, except a device that supplies the storage tank with air, the idea of which I got from one of my neighbors, although it is possible that it is quite common. For the general water supply I arranged a tank pump, with a pressure regulator, so that the pressure is maintained constant, and when any extra water is drawn the pump runs faster, automatically. I should think, however, that if a very large supply was necessary it would need a storage tank."

More Natural Gas.

A Bloomington, Ill., dispatch says: "While a four-inch well was being drilled six miles southeast of this city natural gas was struck at a depth of 120 feet, in a bed of gravel lying under many feet of blue clay. The drilling tools were hurled into the air, and a column of gravel and stones has since been thrown continuously to the height of 100 feet. The pressure is enormous, and the output exceeds greatly that of all the many gas veins that have been struck in Central Illinois."

The two new freight steamships of the White Star line are each 460 feet long, 49 feet beam, and 35 feet in depth. Their carrying capacity is about 10,000 tons. They are twin screw vessels, with a speed of 13 to 14 knots. Each can carry 1,200 head of cattle, and has capacity in its refrigerator for 2,400 quarters of dressed beef.

A correspondent is desirous of knowing of parties who sell animal charcoal.

Machinists' Supplies and Iron.

NEW YORK, May 2, 1891.

Iron—American Pig. The market remains unchanged. We quote No. 1 Foundry, Standard Northern brands, $17 to $18; No. 2 is selling at $16 to $17, and Gray Forge at $14 to $14.50. Southern brands of good quality are obtainable at $16 to $17.50 for No. 1 Foundry; and $15.75 to $16 for No. 2; and $14 to $14.50 for No. 3.

Scotch Pig—We quote at $24.50 for Coltness; $22 for Dalmellington; and $20.50 for Eglinton.

Copper—Arizona Ingot is offering at 12¾c. to 13c. Casting copper is nominal at 11½c. The market is waiting for something to turn up, and buyers are hesitating. The price of Lake Copper is quoted at 14c.

Lead—Increased demand and apparent short supplies have strengthened the views of holders. Sales have been made at 4.15c. to 4.25c.

Spelter—The market is unchanged, as brokers are offering for shipments at 4.85c. with freight paid to New York.

Tin—There is more or less speculative dealing, with sales at 19.65c. for spot, and at 19.85c. for prompt delivery.

Antimony—The market is unsettled and nominal. The lower tendency for spot delivery has been checked, as supplies are said to be comparatively light.

We quote Hallett's, 15¼c. to 15¾c.; Cookson's, 16¾c. to 17c; and 15¾c. for X. L.

Lard Oil—The market is unchanged at 55c. to 55½c. for Prime City, according to holder and quantity.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Wanted—Agents in every shop for fine tools; big inducements. Address E. G. Smith, Columbus, Pa.

A well-recommended millwright and machinist wants position. Address Expert, AM. MACHINIST.

Wanted—Situation in Conn., by an inventor, mechanical draftsman; 18 years exp. at general mach. work. A 1 reference. D. C. S., AM. MACHINIST.

Wanted—Situation by a molder who understands light castings; American; sober and industrious. Address Charles B. Curtis, Spencerport, N. Y.

Wanted—By young man, 26, position as draftsman; would combine shop work with drawing; not afraid of work; 11 years exp.; ref. C. B. H., AM. MACH.

A comp. mech. eng. and draftsman will be open for engagement about June 1st. Thorough in designing compound engines and general mach. Well up in electricity. Box 87, AMERICAN MACHINIST.

Wanted—Foreman for brass finishing department on valves, cocks and specialties; must have executive ability, and be familiar with modern tools. Address, stating salary req'd, Box 75, AM. MACHINIST.

Wanted—Position as draftsman by young man 23; have had 3 years at technical school, 2 years' experience in machine shop, and experience as practical draftsman. W. L. S., AM. MACHINIST.

Wanted—Foreman to take charge of a machine shop employing about fifty men; must be energetic, competent to manage men, and experienced in building high grade steam engines. Address M. Co., AM. MACHINIST.

Machinists Wanted—We can employ a few good workmen. Those experienced on marine work preferred; only first-class men employed. Apply personally at works of Charles L. Seabury & Co., Nyack-on-Hudson, N. Y.

Wanted—Several good machinists to work in machine shop doing general work; wages, $2.40 to $3.00 per day to men suitable; those wanting work apply to or address Kenney & Co., Scottdale, Pa.

Wanted—Foreman for agricultural implement works; must be experienced in small castings, competent and temperate. Situation permanent for the right man. Address, giving age, salary expected, refs., etc., The Fuller-Lee Mfg. Co., Winfield, Kan.

Wanted—A good tool maker and general machinist—one capable of designing and making tools for screw machines, for the cheap manufacture of set, cap and special screws, etc. Apply, giving references as to ability, character, etc., and stating salary, to Box 88, AMERICAN MACHINIST.

Wanted—Foundry foreman; one skilled in heavy work of all kinds, in loam, dry and green sand work; must be well up in this line, and strictly temperate; permanent position and good wages to right man. Address, giving experience and reference, Bole, 624, Columbus, Ohio.

Tool Makers Wanted—Two good tool makers accustomed to sewing machine work. Apply Demorest F. & S. M. Co., Williamsport, Pa.

Wanted Immediately—An A No. 1 draftsman and designer to take charge of drawing and designing in shop manufacturing a line of automatic and fine light machinery. None but first-class men need apply. R. D. Nuttall & Co., 179 to 189 Grand Avenue, Allegheny.

Wanted—Vise hands; a few good tool makers to work on punches and dies, and screw machine tools. Address, stating age, experience, and wages wanted, Metric Metal Co., Beaver Falls, Pa. Works will soon be removed to Erie, Pa.

Wanted—Position as supt. or foreman, by a young man, 36, successful in the systematic manufacture of machinery and mechanical devices, and in the economical management of men; a designer and draftsman of automatic and interchangeable machinery, tools, jigs, etc. W. H. S., Box 197, Burnside, Conn.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

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Special wire mach'ry. Amer. Tool Wks., Clev'd, O.

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New catalogue of engineers' specialties free. Crescent Mfg. Co., Cleveland, Ohio.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Wanted—Customers for our new Radial Drills. C. H. Baush & Sons, Holyoke, Mass.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

To Iron Founders—My new hot water heating system for sale; also new radiator. Address N. N., AMERICAN MACHINIST.

A mechanical engineer (mem. A. S. M. E.) with office in New York, desires to represent the manfr. of some good specialty. A. S. M. E., AM. MACH.

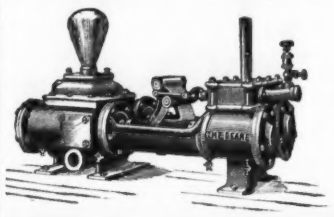
Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., P. O. Box 1262, Phila., Pa.

Patent for sale of the Fast-feeding, Drilling and automatic carry Drilling Machines, entirely new motion; can be seen running at Schwarzler & Voss, 1830 Park Avenue, New York.

I have the best facilities for manufacturing heavy special machine; willing to put money in some machine of merit. S. Hartley, 245 N. J. R. R. Avenue, Newark, N. J.

A well-established firm in Germany wants to represent, or take license to manufacture, a patented American article in the iron or metal line. Address propositions to W. Grevel, B'way and 10th st., N. Y.

Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.



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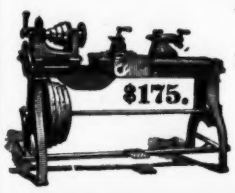

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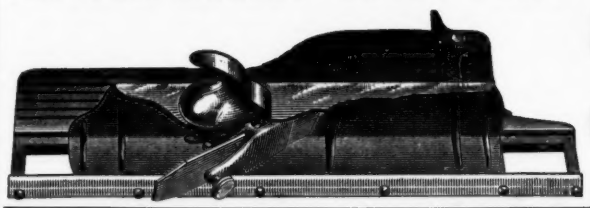
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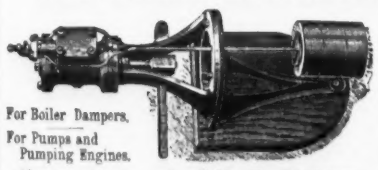
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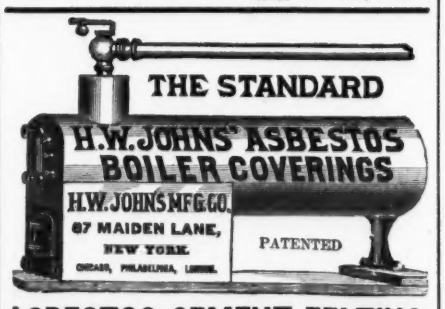

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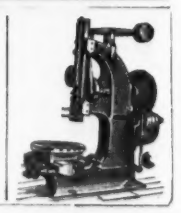

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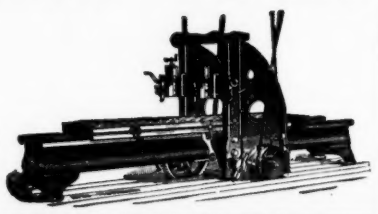

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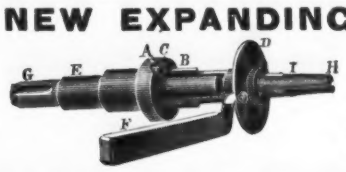

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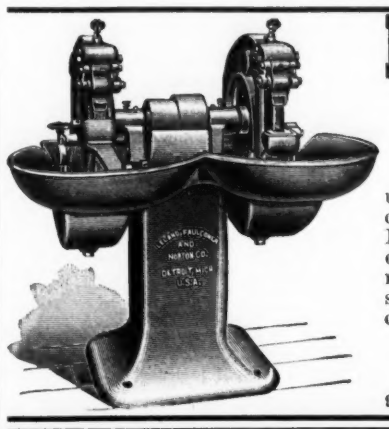

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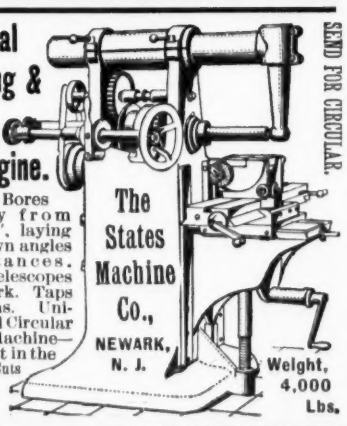

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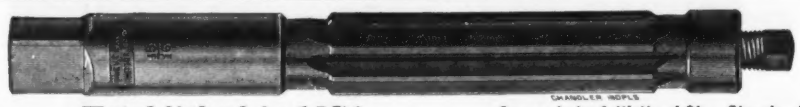

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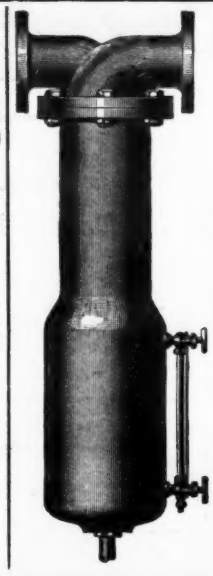

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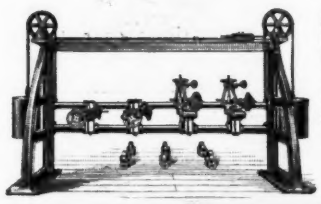

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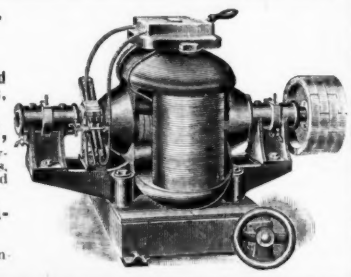

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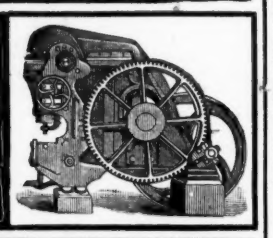

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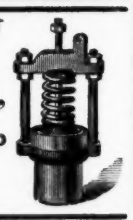

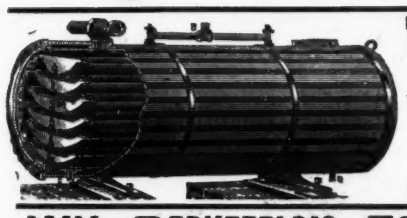

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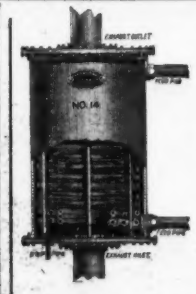

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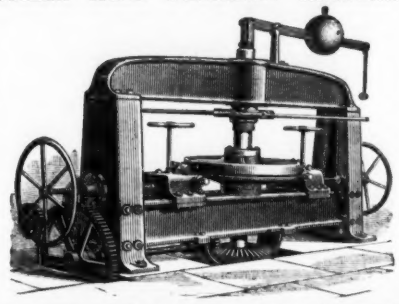

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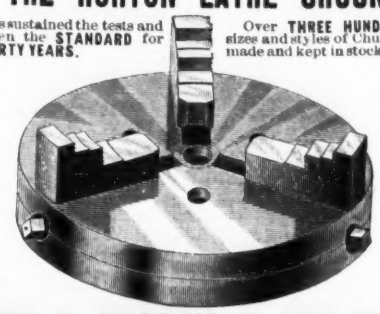

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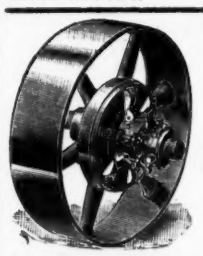

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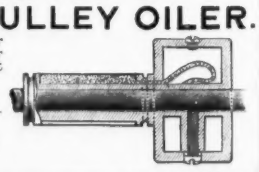

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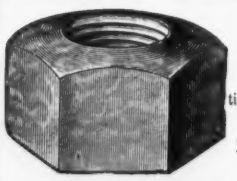

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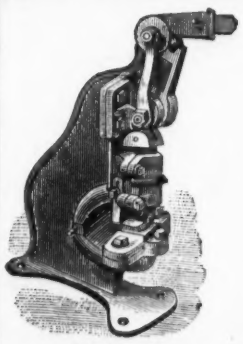

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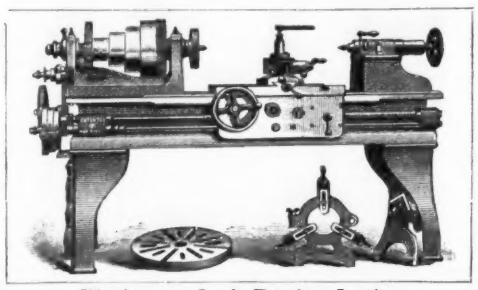

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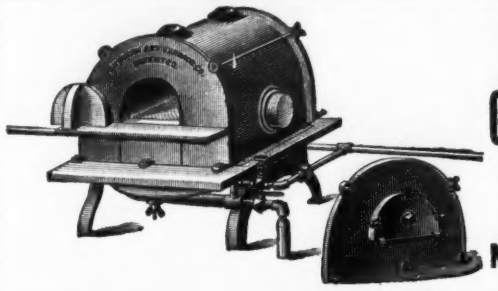

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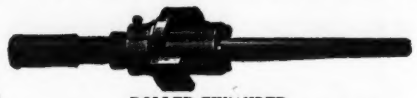

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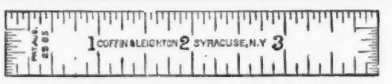

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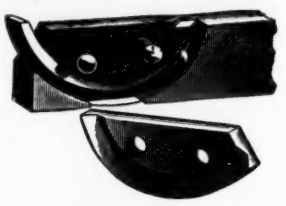

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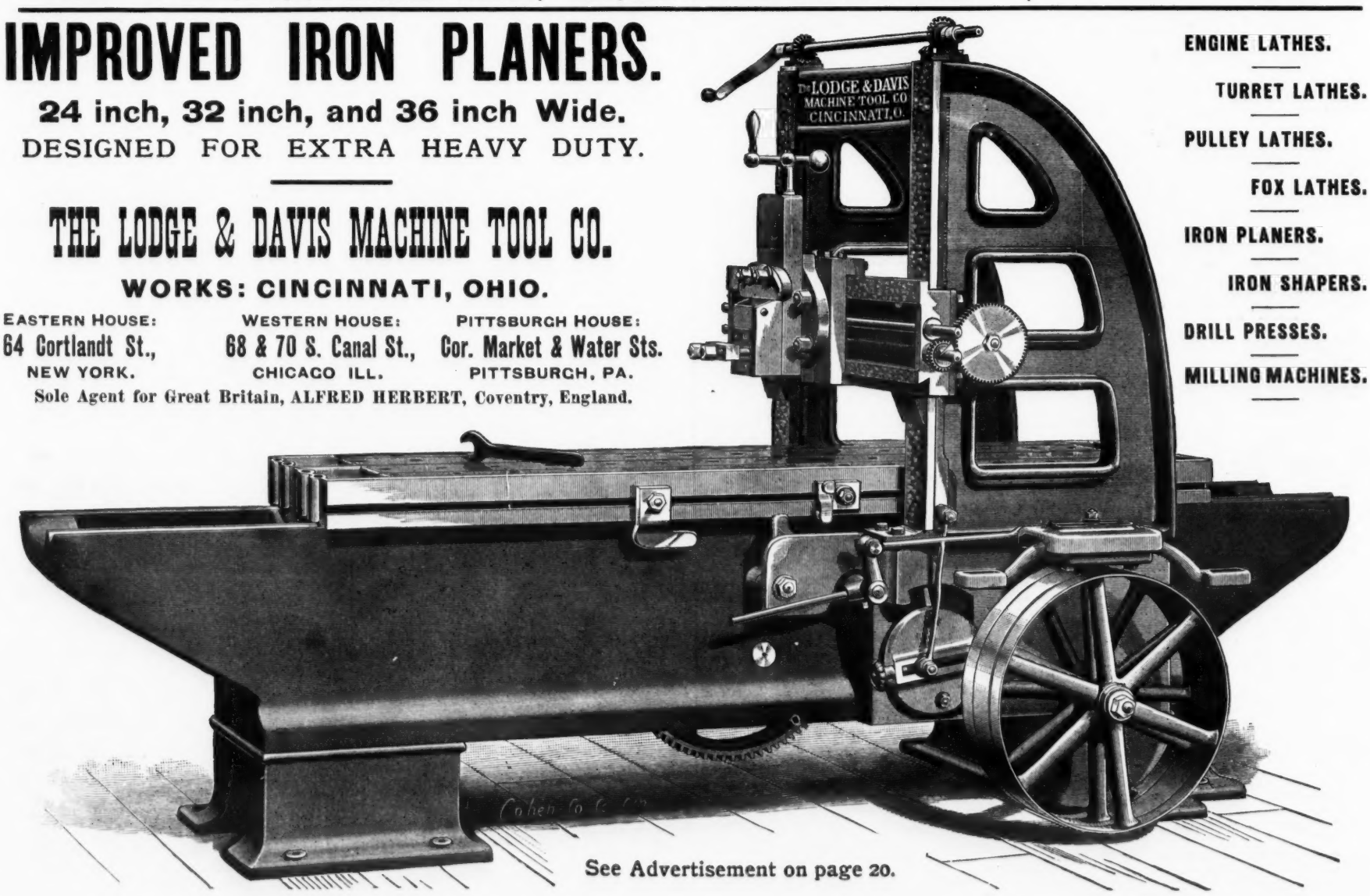

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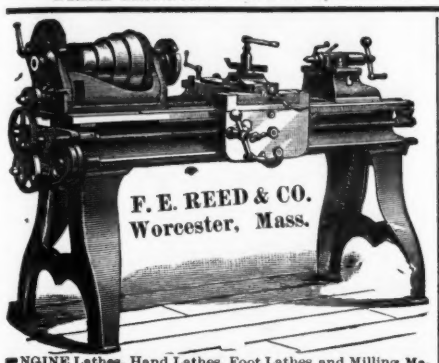

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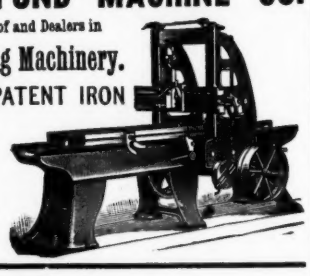

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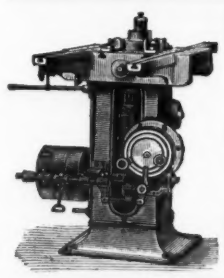

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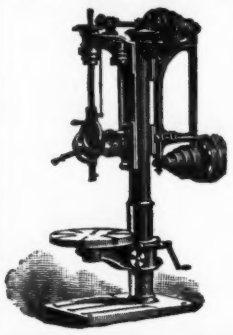

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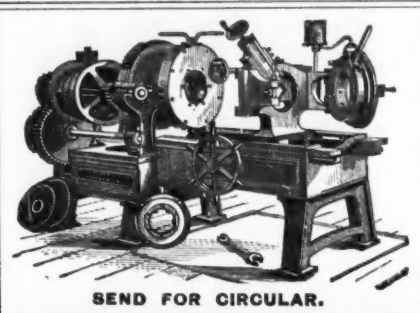

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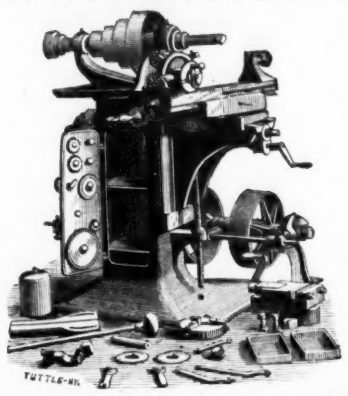

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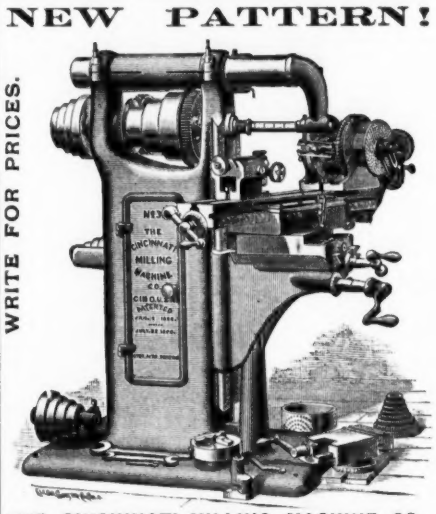

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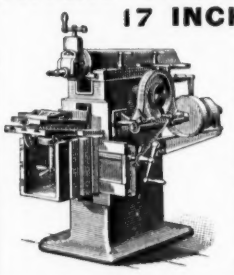

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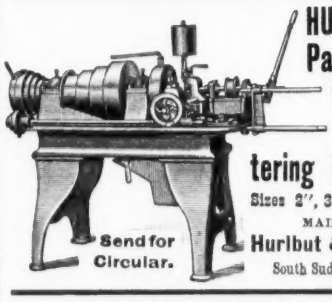

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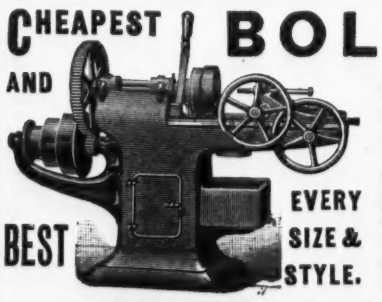

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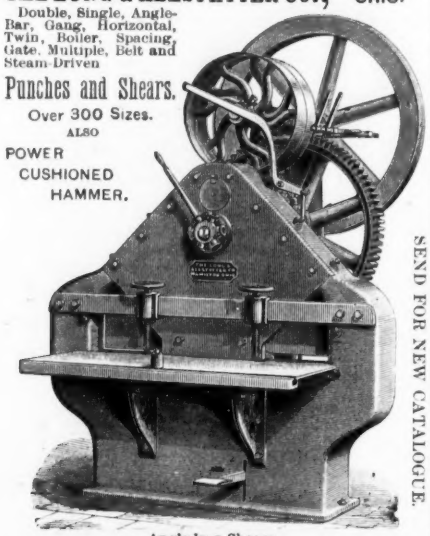
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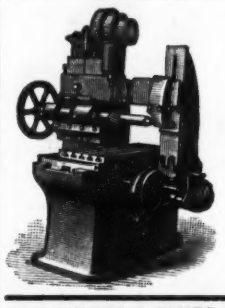
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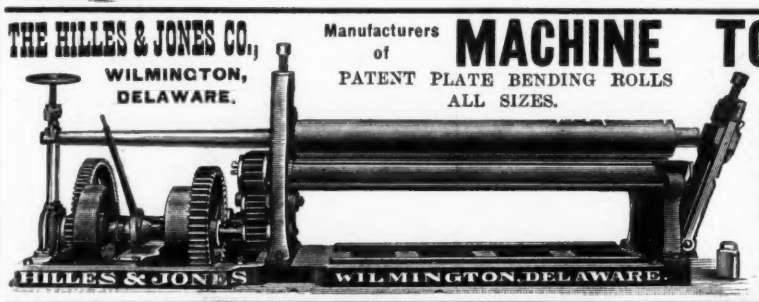
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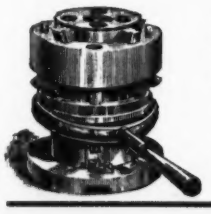
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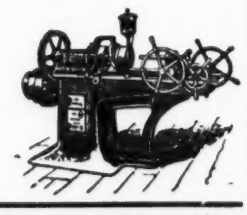
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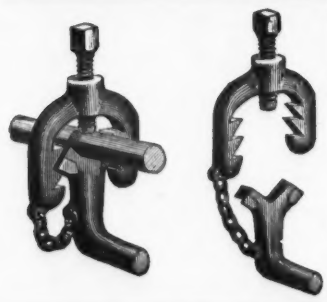
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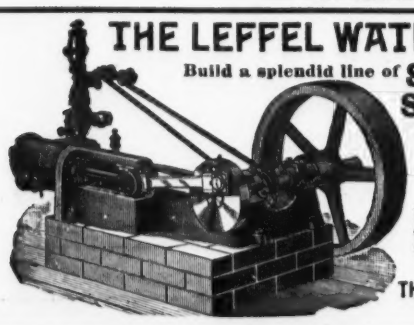
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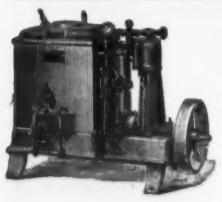
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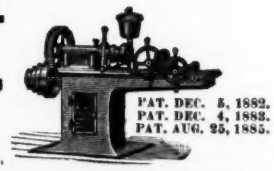
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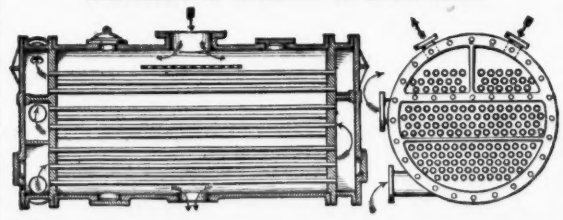
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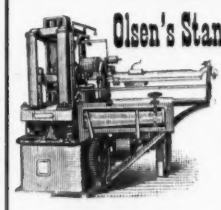
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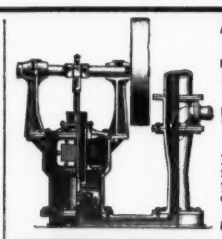
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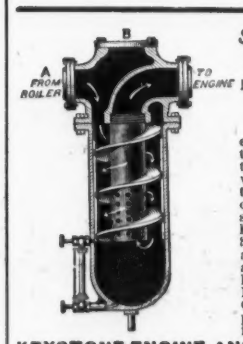

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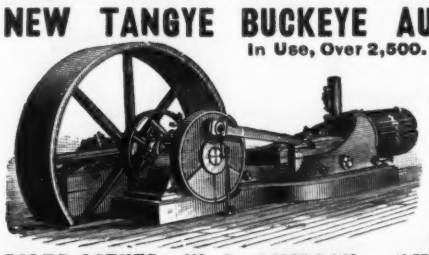

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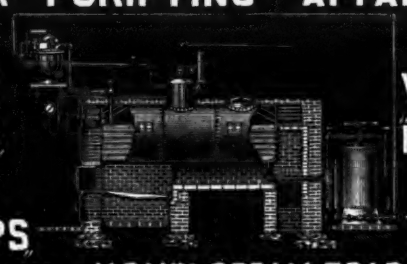

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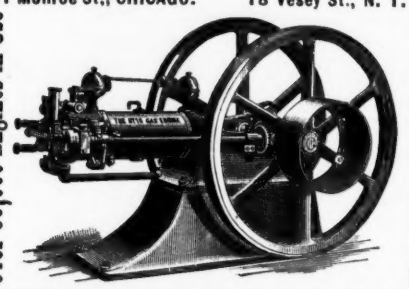

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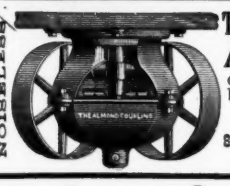

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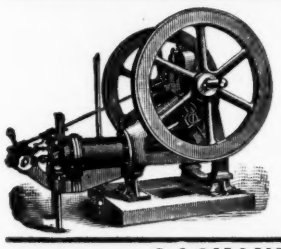

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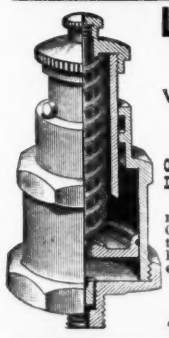

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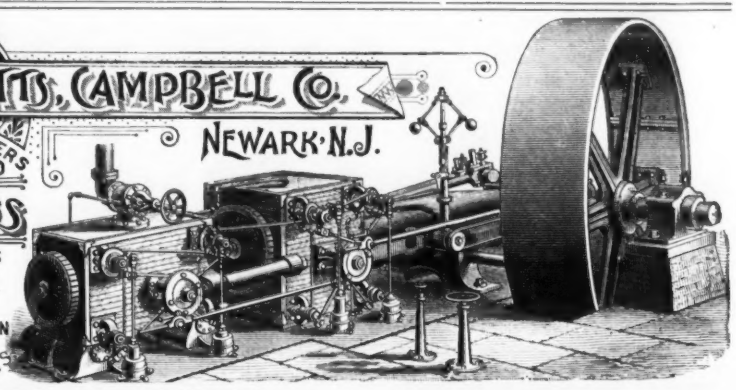

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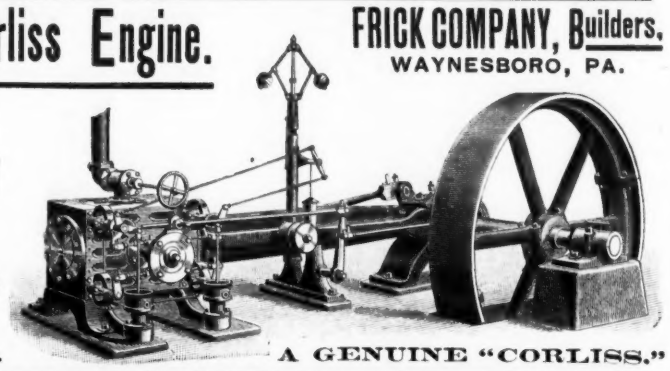

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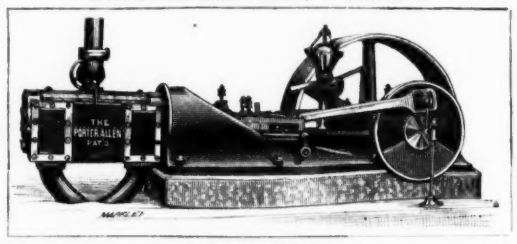

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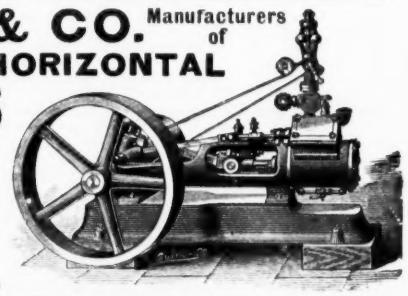

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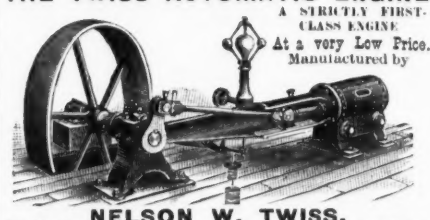

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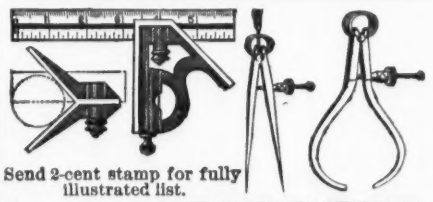

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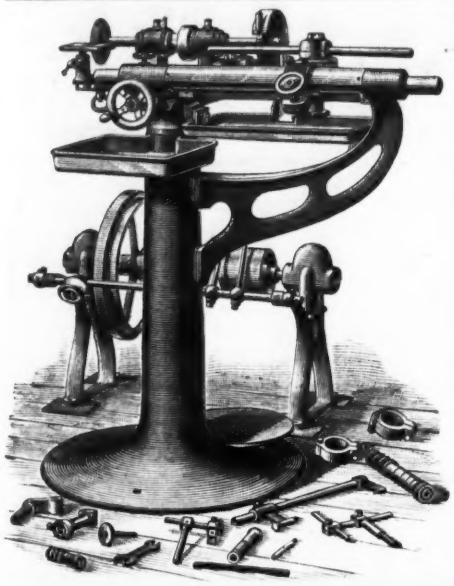
FRANK H. BALL, V. Prest. and Gen'l Manager. **THOMAS C. WOOD,** President.



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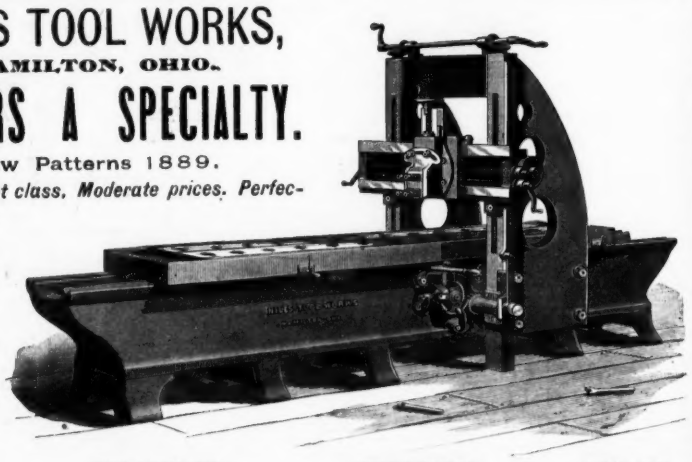

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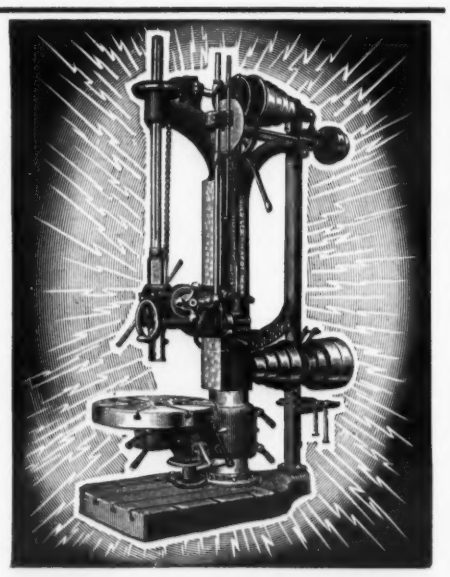

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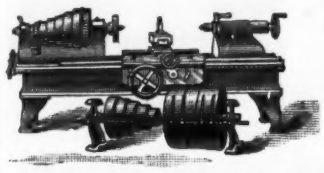

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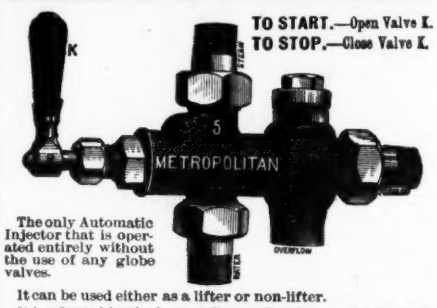

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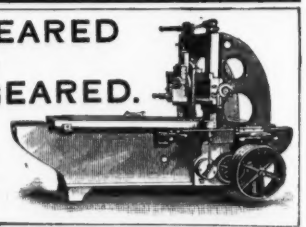

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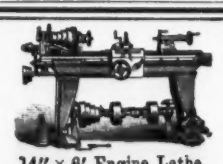

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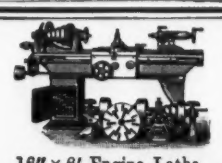
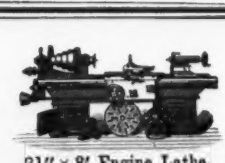


16″ × 6′ Engine Lathe.



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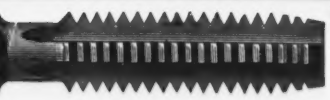

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